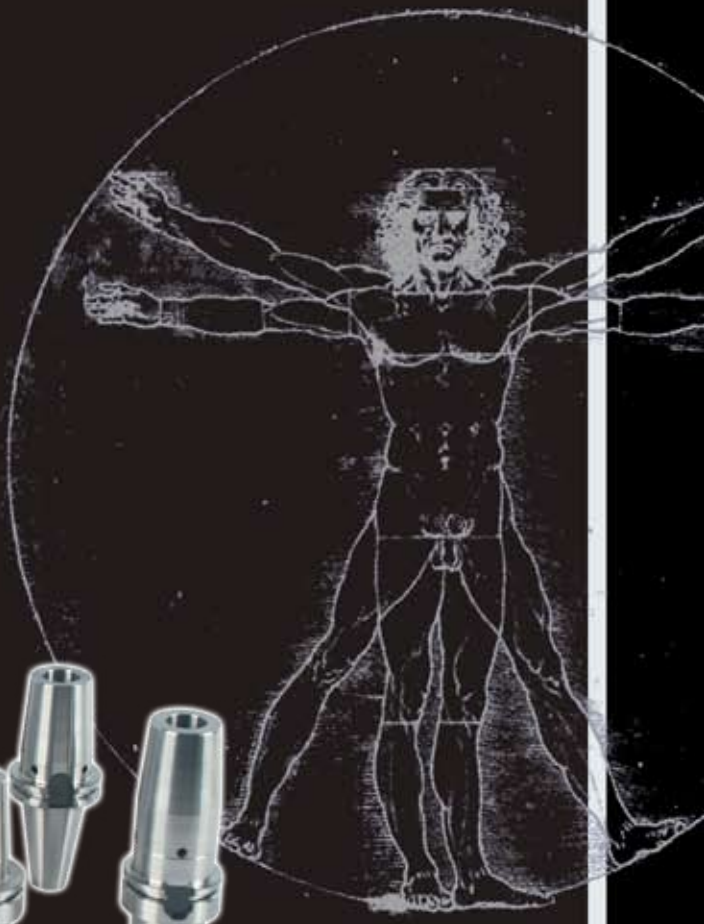
S.p.A.

TOOLS ENGINEERING & MANUFACTURING



NUOVO PROGRAMMA PER CALETTAMENTO TERMICO

NEW SHRINKING FIT PROGRAM

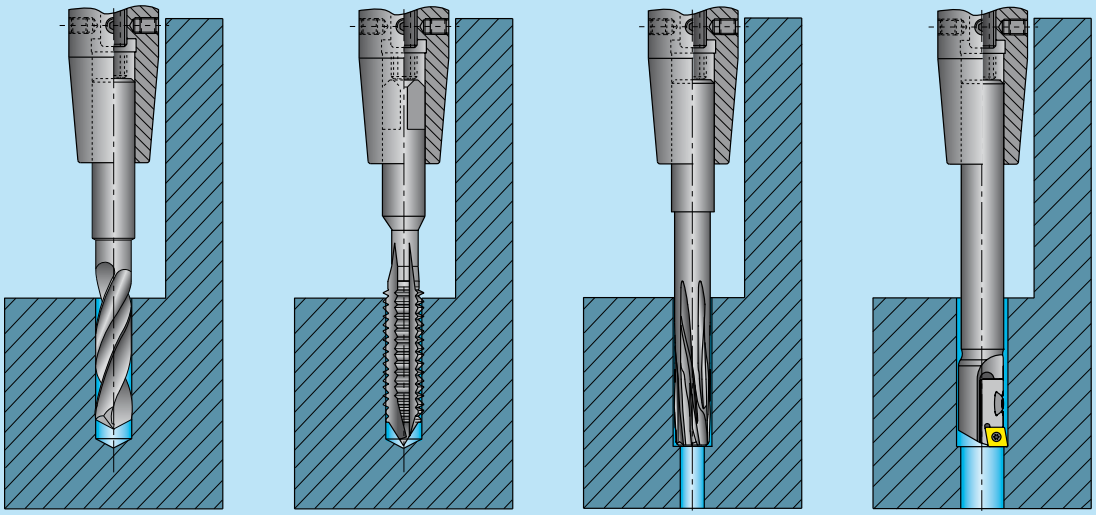
NEWS 207/3

FORATURA
DRILLING

MASCHIATURA
TAPPING

ALESATURA
BORING

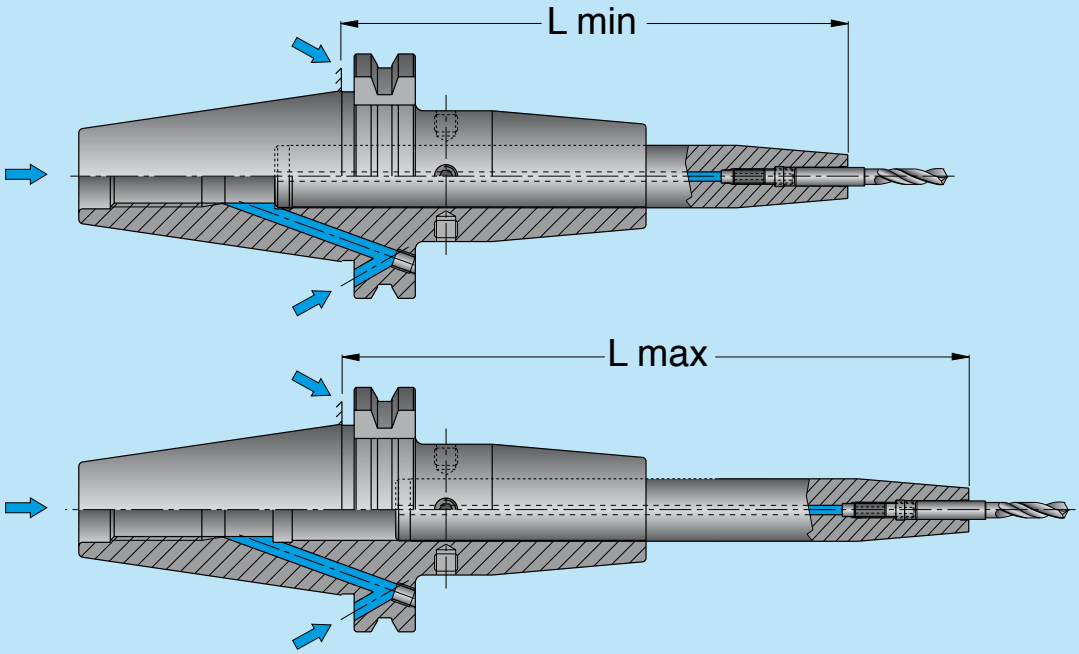
RADDRIZZATURA
STRAIGHTENING



STESSO INGOMBRO PER ARTICOLI DI MASCHIATURA - FORATURA - ALESATURA - RADDRIZZATURA

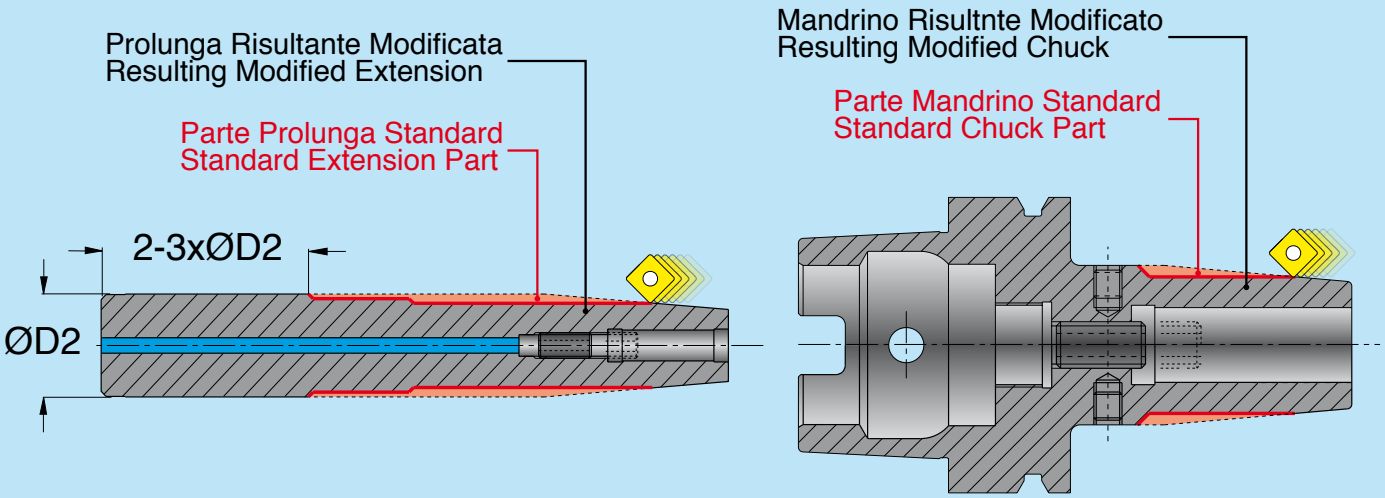
SAME OVERALL SIZE FOR TAPPING - DRILLING - BORING - STRAIGHTENING ITEMS

CTP



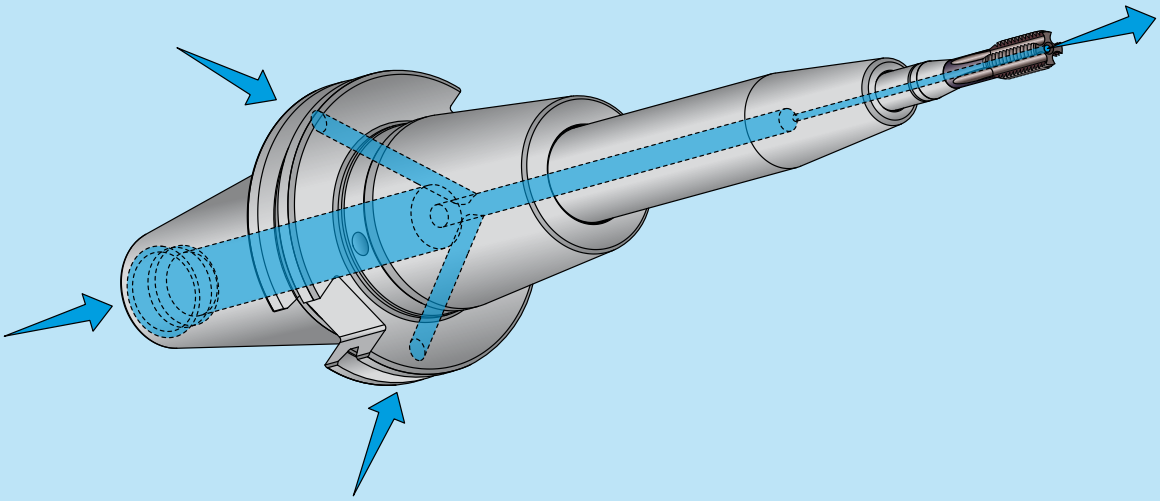
FLESSIBILITÁ IN LUNGHEZZA CON MANDRINI TIPO "CTP"

FLEXIBILITY IN LENGTH WITH CHUCK TYPE "CTP"



POSSIBILITÁ DI MODIFICA DEI MANDRINI

POSSIBILITY TO MODIFY THE CHUCKS



REFRIGERAZIONE INTERNA

INTERNAL COOLING

INFO

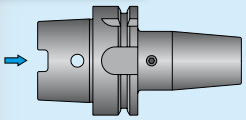
IL SISTEMA DEL CALETTAMENTO A CALDO
- SHRINK-FIT-SYSTEM
- SCHRUMPFVERBINDUNGSSYSTEM
- LE SYSTÈME À EMBOÎTEMENT THERMIQUE

PAG 6÷9

HSK - DIN 69893-A

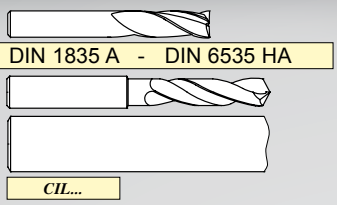
MANDRINO A CALETTAMENTO TERMICO
- SHRINKING-ON TAPER SHANKS
- WERKZEUGAUFNAHMEN MIT SCHRUMPFVERBINDUNG
- MANDRIN À EMBOÎTEMENT THERMIQUE

HKA. ... .CT...



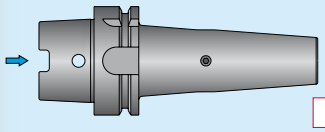
DIN 69882-8

PAG 10

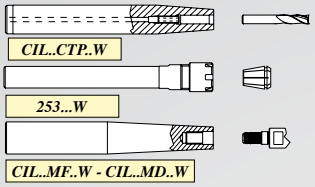


MANDRINO A CALETTAMENTO TERMICO PROLUNGABILE
- EXTENSIBLE SHRINK FIT
- VERLÄNGERBARES SCHRUMPFFUTTER
- MANDRIN PROLONGEABLE À EMBOÎTEMENT THERMIQUE.

HKA. ... .CTP..

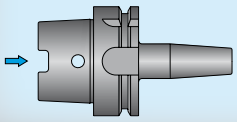


PAG 11



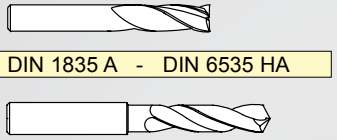
MANDRINO A CALETTAMENTO TERMICO DI FINITURA-INGOMBRO RIDOTTO
- SHRINK FIT FOR FINISHING-REDUCED DIMENSIONS.
- SCHRUMPFFUTTER ZUM SCHLICHTEN-KLEINER PLATZBEDARF
- MANDRIN POUR FINISSAGE À EMBOÎTEMENT THERMIQUE-ENCOMBREMENT RÉDUIT.

HKA. 063 CT F..



NEW

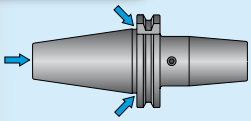
PAG 12



DIN 69871

MANDRINO A CALETTAMENTO TERMICO
- SHRINKING-ON TAPER SHANKS
- WERKZEUGAUFNAHMEN MIT SCHRUMPFVERBINDUNG
- MANDRIN À EMBOÎTEMENT THERMIQUE

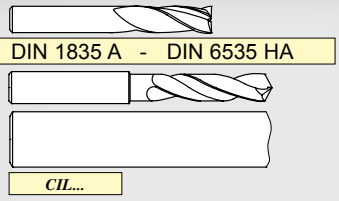
SKB. ... .CT..
..... /A - AD - B



DIN 69882-8

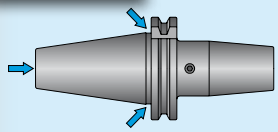
NEW

PAG 13

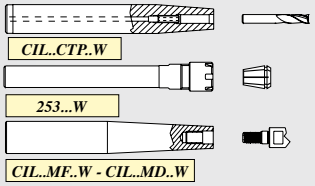


MANDRINO A CALETTAMENTO TERMICO PROLUNGABILE
- EXTENSIBLE SHRINK FIT
- VERLÄNGERBARES SCHRUMPFFUTTER
- MANDRIN PROLONGEABLE À EMBOÎTEMENT THERMIQUE.

SKB. ... .CTP..
..... /A - AD - B



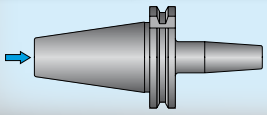
PAG 14



MANDRINO A CALETTAMENTO TERMICO DI FINITURA-INGOMBRO RIDOTTO
- SHRINK FIT FOR FINISHING-REDUCED DIMENSIONS.
- SCHRUMPFFUTTER ZUM SCHLICHTEN-KLEINER PLATZBEDARF
- MANDRIN POUR FINISSAGE À EMBOÎTEMENT THERMIQUE-ENCOMBREMENT RÉDUIT.

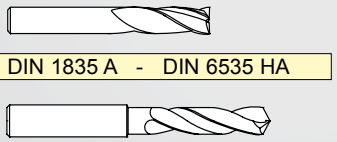
SKA.40.CT F..
..... /A - AD

SKB.40.CT F..
..... /A - AD - B



NEW

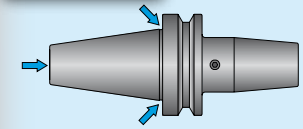
PAG 15



MAS 403 BT-A-B

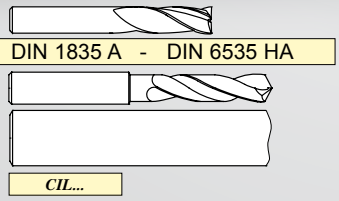
MANDRINO A CALETTAMENTO TERMICO
- SHRINKING-ON TAPER SHANKS
- WERKZEUGAUFNAHMEN MIT SCHRUMPFVERBINDUNG
- MANDRIN À EMBOÎTEMENT THERMIQUE

BTB. ... .CT..
..... /A - AD - B



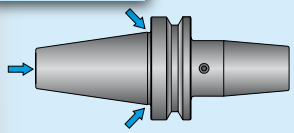
DIN 69882-8

PAG 16

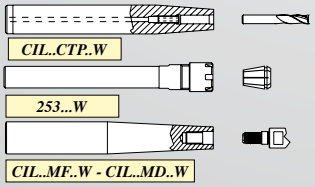


MANDRINO A CALETTAMENTO TERMICO PROLUNGABILE
- EXTENSIBLE SHRINK FIT
- VERLÄNGERBARES SCHRUMPFFUTTER
- MANDRIN PROLONGEABLE À EMBOÎTEMENT THERMIQUE.

BTB. ... .CTP..
..... /A - AD - B

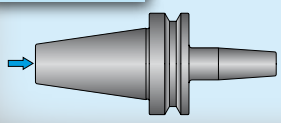


PAG 17

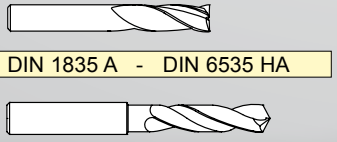


MANDRINO A CALETTAMENTO TERMICO DI FINITURA-INGOMBRO RIDOTTO
- SHRINK FIT FOR FINISHING-REDUCED DIMENSIONS.
- SCHRUMPFFUTTER ZUM SCHLICHTEN-KLEINER PLATZBEDARF
- MANDRIN POUR FINISSAGE À EMBOÎTEMENT THERMIQUE-ENCOMBREMENT RÉDUIT.

BTA.040.CT F..
..... /A - AD



PAG 18



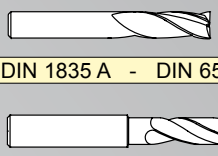
EXTENSION

PROLUNGA IN ACCIAIO CON ATTACCO A CALETTAMENTO TERMICO
- STEEL SHRINK-FIT EXTENSION.
- STAHL VERLÄNGERUNG MIT SCHRUMPFVERBINDUNG
- RALLONGE EN ACIER AVEC ATTACHEMENT À EMBOÎTEMENT THERMIQUE

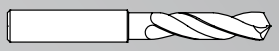
CIL..CTP..W

NEW

PAG 19



DIN 1835 A - DIN 6535 HA



MACHINES

MACCHINA PER IL CALETTAMENTO TERMICO CON SISTEMA A INDUZIONE MAGNETICA
- THERMAL COUPLING MACHINE WITH MAGNETIC INDUCTION SYSTEM.
- SCHRUMPFVERFAHRENMASCHING MIT MAGNETISCHEM INDUKTIONSSYSTEM
- MACHINE POUR LE FRETTAGE TERMIQUE AVEC SYSTEMÈ À INDUCTION MAGNÉTIQUE.

MCT 332A

PAG 20÷21

MACCHINA CON MONTANTE PNEUMATICO PER CALETTAMENTO TERMICO A INDUZIONE MAGNETICA
- MACHINE WITH PNEUMATIC VERTICAL ROD FOR HEAT SHRINKING BY MAGNETIC INDUCTION
- MASCHINE MIT PNEUMATISCHEM STÄNDER ZUR SCHRUMPFVERBINDUNG MITTELS MAGNETISCHER INDUKTION
- MACHINE AVEC MONTANT PNEUMATIQUE POUR EMBOÎTEMENT THERMIQUE À INDUCTION MAGNÉTIQUE

MCT 332B

NEW

PAG 22÷23

UNITÀ AUTOMATICA DI RAFFREDDAMENTO RAPIDO
- AUTOMATIC RAPID COOLING UNIT
- UNITÉ AUTOMATIQUE DE REFROIDISSEMENT RAPIDE
- AUTOMATISCHE SCHNELLKÜHLEINHEIT

MCT URR-01

NEW

PAG 24÷25

ACCESSORIES

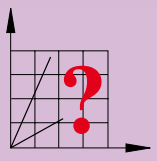
ACCESSORI
- ACCESSORIES
- ZUBEHÖR
- ACCESSOIRES

NEW

PAG 26÷29

TECH.DATA

DATI TECNICI
- TECHNICAL DATA
- TECHNISCHEN DATEN
- DONNÉES TECHNIQUES

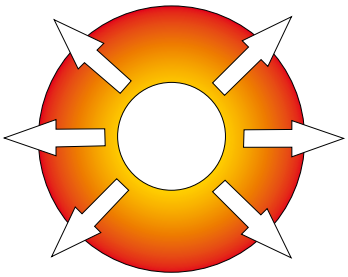


PAG 30÷32

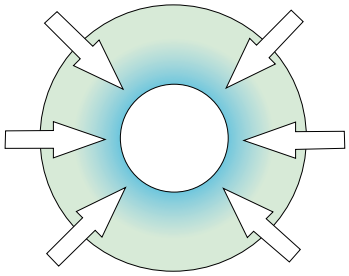
TECNICA DEL SISTEMA DI CALETTAMENTO A CALDO
TECHNIQUE OF THE SHRINKING-ON SYSTEM

Il fissaggio a caldo si basa sul principio della dilatazione degli acciai in funzione della variazione di temperatura: aumentando la temperatura del mandrino nella zona da dilatare, si ottiene un aumento del diametro interno che permette l'inserimento dell'utensile a gambo cilindrico. Raffreddando il mandrino il foro interno torna alla dimensione normale, creando una costante ed elevata pressione su tutta la superficie in contatto con l'utensile. Il risultato è un insieme molto omogeneo di mandrino ed utensile con una forza di serraggio radiale molto forte tale da creare un sistema rigido e preciso. Utilizzando il riscaldamento per induzione magnetica si ottiene una velocità di riscaldamento del mandrino tale che l'utensile non ha il tempo di riscaldarsi, consentendo di calettare utensili in acciaio super rapido e in metallo duro.
Le temperature ottenute durante la fase di riscaldamento, che normalmente dura pochi secondi, sono pari a circa 300-340°, per cui molto inferiori a temperature che potrebbero creare delle alterazioni strutturali del materiale di cui sono composti i mandrini, per cui è teoricamente possibile eseguire il processo un numero infinito di volte senza avere deformazioni permanenti.

This clamping system is based upon the principle of the expansion of steel determined by temperature variations. By increasing the taper shank temperature in the area that must be expanded, an enlargement of the internal diameter is obtained, thus enabling the fitting of a cylinder stem tool.
When cooling down the taper shank, the normal size of the internal bore is restored, creating a constant high pressure on the whole surface touching the tool.
The result is a highly homogeneous connection between taper shank and tool with very high radial clamping force which creates a rigid and precise system.
By using the magnetic induction heating system it is possible to achieve a very fast heating of the taper shank before the tool has time enough to be heated.
This enables the shrinking-on of HSS and solid carbide tools. The temperatures obtained during the heating phase, that normally lasts only a few seconds, are about 300-340°, therefore much lower than those that might cause structural alterations in the material of the taper shanks.
Therefore it is theoretically possible to perform the process an infinite number of times without having any permanent.



IL CALORE ESPANDE IL DIAMETRO INTERNO
HEAT EXPANDS THE INSIDE DIAMETER



IL RAFFREDDAMENTO RESTRINGE IL DIAMETRO INTERNO
COOLING CONTRACTS THE INSIDE DIAMETER

VANTAGGI DELLA TECNOLOGIA DEL CALETTAMENTO A CALDO
ADVANTAGES OF THE SHRINK-FIT TECHNOLOGY

1. Rapido inserimento ed estrazione dell'utensile
2. Elevata forza di bloccaggio radiale ed elevata trasmissione di coppia
3. Notevole diminuizione della forza di bloccaggio ad alte velocità
4. Maggiore durata dell'utensile e del mandrino
5. Ottima finitura superficiale del materiale lavorato grazie all'elevata rigidità del sistema di bloccaggio ed alla ridotta tolleranza di concentricità
6. Ottima rigidità flessionale e radiale
7. Dimensioni ridotte del mandrino e profilo compatto della sede utensile che riduce al minimo gli ingombri; la sede utensile ha un angolo di 4,5° come da normativa DIN 69882-8
8. Bloccaggio di utensili in metallo duro ed in acciaio super rapido con tolleranza del gambo h6 secondo DIN 6535HA e DIN 1835A sullo stesso mandrino
9. Mandrini con elevata durata e stabilità di forma, grazie all'utilizzo di acciaio speciale resistente alle alte temperature e di particolari trattamenti termici
10. Valori di concentricità nell'accoppiamento mandrino-utensile inferiori a 3 MICRON con ripetibilità assoluta nel tempo
11. Mandrini proggettati con geometria simmetrica senza masse di sbilanciamento adatti per lavorazioni ad alta velocità, per le quali é richiesta una elevata equilibratura dinamica
12. Flessibilità elevata grazie alla possibilità di combinare i mandrini con prolunghe ed accessori di vario tipo

1. Quick installation and removal of the tool
2. High radial clamping force and high torque transmission
3. Notable reduction of the clamping force at high speed
4. Longer tool and taper shank life
5. Excellent surface finishing of the work piece thanks to the rigidity of the clamping system and low concentricity tolerance
6. Excellent bending strength and radial rigidity
7. Small taper shank size and compact profile of the insert pocket to minimize the overall dimensions; the tool seat features a corner of 4,5° according to DIN 69882-8
8. Clamping of solid carbide and HSS tools with h6 tolerance for the stem according to DIN 6535HA and DIN 1835A on the same taper shank
9. Taper shanks with high resistance and shape stability thanks to the use of special steel resistant to high temperatures and special heat treatments
10. Concentricity values in the connection between tool and taper shank lower than 3 micron with absolute repeatability over time
11. Taper shanks designed with symmetrical geometry without unbalancing masses, suitable for high speed machining which, however requires a high dynamic balancing
12. High flexibility thanks to the possibility of combining the taper shanks with extensions and accessories of various type

MANDRINO A CALETTAMENTO TERMICO
SHRINKING-ON TAPER SHANKS
WERKZEUGAUFNAHMEN MIT SCHRUMPFVERBINDUNG
MANDRIN À EMBOÎTEMENT THERMIQUE

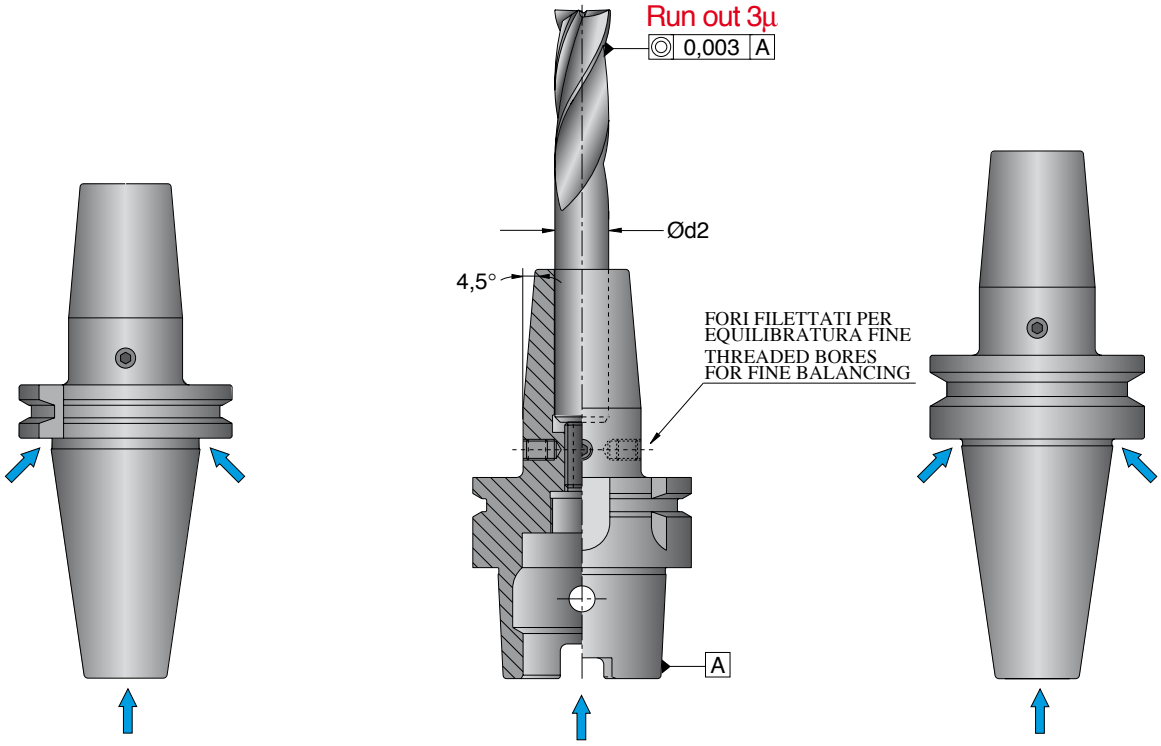
CT

I mandrini CT sono la prima scelta per l'impiego di questa tecnologia in quanto rappresentano l'equilibrio ideale tra ingombro, rigidità e trasmissione di coppia. Le dimensioni di ingombro sono secondo la normativa DIN 69882-8. Visto il loro largo impiego é disponibile una vasta gamma di dimensioni con fori di calettamento da Ø6 a Ø32 in versione corta e lunga.

The CT taper shanks are the first choice for the application of this technology since they represent the perfect combination of reduced dimensions, rigidity and torque transmission. The overall dimensions comply with the requirement set down in DIN 69882-8. Being widely used, they are available in a large range of sizes with shrinking-on bores varying from Ø6 to Ø32, in short and long versions.

STATO DI EQUILIBRATURA - BALANCING STATUS		
SK - DIN 69871	**HSK - DIN 69893**	**BT - MAS 403**
MANDRINI EQUILIBRATI CON FORI FILETTATI PER EQUILIBRATURA FINE PRE-BALANCED TAPER SHANKS WITH THREADED BORES FOR FINE BALANCING		
SK 040 Rpm 25000 G.2,5	HSK 63 A Rpm 25000 G.2,5	BT 040 Rpm 25000 G.2,5
SK 050 Rpm 25000 G.2,5	HSK 100 A Rpm 25000 G.2,5	BT 050 Rpm 25000 G.2,5

Utilizzare utensili con gambo cilindrico in tolleranza h6 o inferiore.
Use tools with cylinder shaft in h6 tolerance or lower.



SE SI POSSIEDE UNA MACCHINA EQUILIBRATRICE È POSSIBILE EFFETTUARE L'EQUILIBRATURA FINE MEDIANTE L'INSERIMENTO DI GRANI NEGLI APPOSITI FORI FILETTATI.

WHERE A BALANCING MACHINE IS AVAILABLE, IT IS POSSIBLE TO CARRY OUT THE FINE BALANCING PROCEDURE BY INSERTING DOWELS IN THE RELEVANT THREADED BORES.

MANDRINO A CALETTAMENTO TERMICO PROLUNGABILE
EXTENSIBLE SHRINK FIT
VERLÄNGERBARES SCHRUMPFFUTTER
MANDRIN PROLONGEABLE À EMBOÎTEMENT THERMIQUE

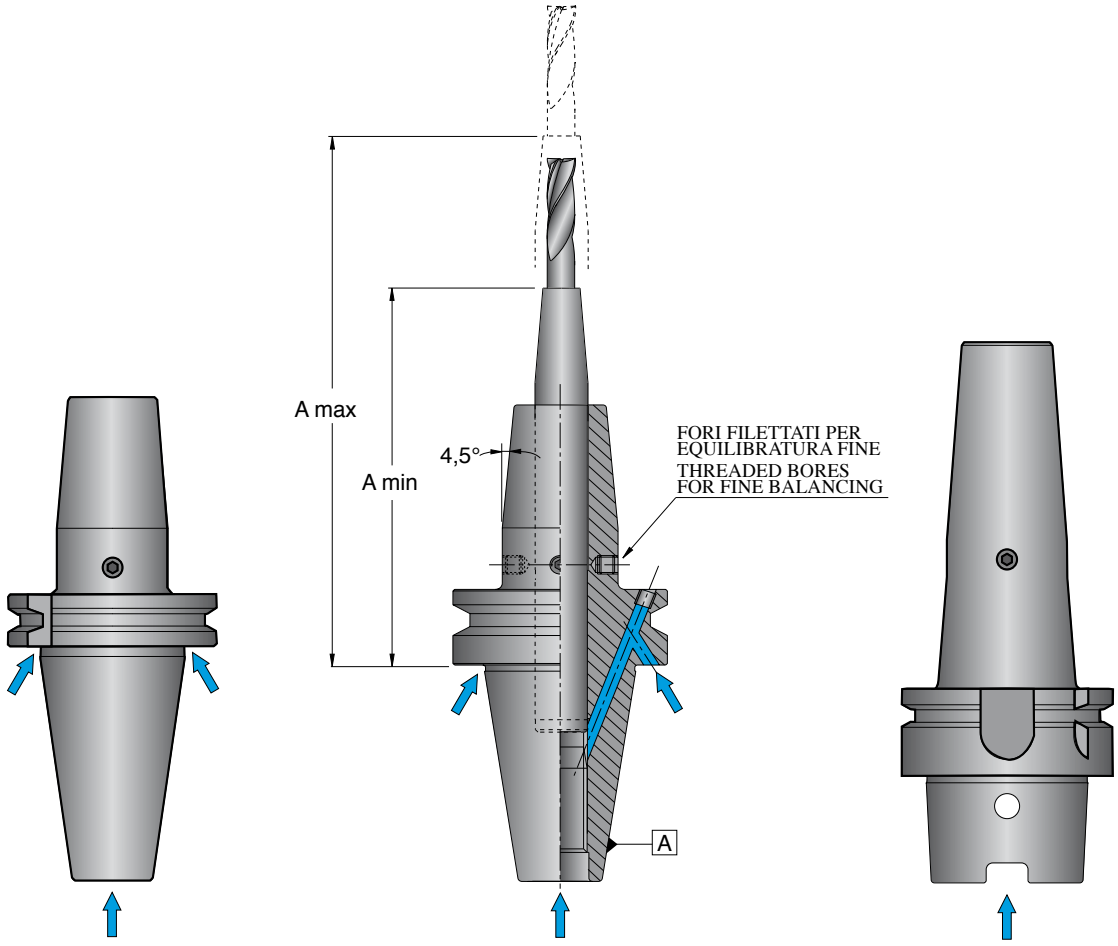
CTP

Questa versione è consigliata unitamente all'utilizzo di utensili a gambo lungo, prolunghe cilindriche a calettamento termico dell'utensile, prolunghe cilindriche in metallo duro antivibrante e nell'impiego sia in fresatura che alesatura di fori, dove si voglia sfruttare la possibilità di regolazione della sporgenza utile dell'utensile, ottimizzandone al meglio l'impiego.

This version is recommended together with the use of long stem tools, tool shrink coupling cylindrical extensions, cylindrical extensions in nonvibrating solid carbide and for the application both in milling and the boring of holes, to exploit the regulation possibilities of the tool's useful protrusion and optimize the machining results to the best possible level.

STATO DI EQUILIBRATURA - BALANCING STATUS		
SK - DIN 69871	**HSK - DIN 69893**	**BT - MAS 403**
MANDRINI EQUILIBRATI CON FORI FILETTATI PER EQUILIBRATURA FINE PRE-BALANCED TAPER SHANKS WITH THREADED BORES FOR FINE BALANCING		
SK 040 Rpm 25000 G.2,5	HSK 63 A Rpm 25000 G.2,5	BT 040 Rpm 25000 G.2,5
SK 050 Rpm 15000 G.2,5	HSK 100 A Rpm 25000 G.2,5	BT 050 Rpm 15000 G.2,5

Utilizzare utensili con gambo cilindrico in tolleranza h6 o inferiore.
Use tools with cylinder shaft in h6 tolerance or lower.



SE SI POSSIEDE UNA MACCHINA EQUILIBRATRICE È POSSIBILE EFFETTUARE L'EQUILIBRATURA FINE MEDIANTE L'INSERIMENTO DI GRANI NEGLI APPOSITI FORI FILETTATI.

WHERE A BALANCING MACHINE IS AVAILABLE, IT IS POSSIBLE TO CARRY OUT THE FINE-BALANCING PROCEDURE BY INSERTING DOWELS IN THE RELEVANT THREADED BORES.

MANDRINO A CALETTAMENTO TERMICO DI FINITURA AD INGOMBRO RIDOTTO
SHRINK FIT FOR FINISHING-REDUCED DIMENSIONS
SCHRUMPFFUTTER ZUM SCHLICHTEN KLEINER PLATZBEDARF
MANDRIN POUR FINISSAGE À EMBOÎTEMENT THERMIQUE-ENCOMBREMENT RÉDUIT

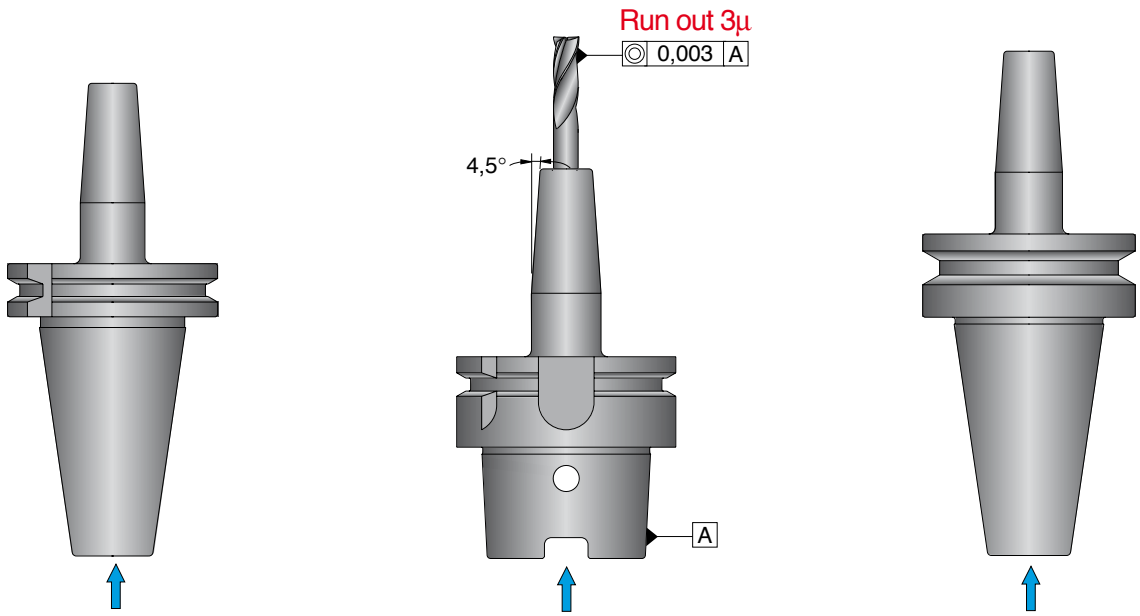
CTF

Questi mandrini sono stati progettati e realizzati principalmente per ridurre al minimo gli ingombri nella zona di taglio.
Sono particolarmente vantaggiosi nelle lavorazioni di finitura ad elevato numeri di giri. Vengono forniti con una equilibratura fine in classe G.2,5 ad un elevato numero di giri. Questi mandrini, grazie al ridotto spessore nell'area di bloccaggio dell'utensile, possono essere utilizzati sia con macchine ad induzione magnetica e sia con tradizionali sistemi ad aria calda.

These taper shanks were designed and manufactured mainly to reduce obstacles in the cutting area to the minimum. These are particularly useful in finishing at a high number of revolutions. They are provided with a fine balance in G.2,5 class at a high number of revolutions. Thanks to the reduced thickness in the tool clamping area, they can be used with machines with magnetic induction and with traditional hot-air systems.

STATO DI EQUILIBRATURA - BALANCING STATUS		
SK - DIN 69871	**HSK - DIN 69893**	**BT - MAS 403**
SK 040 Rpm 25000 G.2,5	HSK 63 A Rpm 25000 G.2,5	BT 040 Rpm 25000 G.2,5

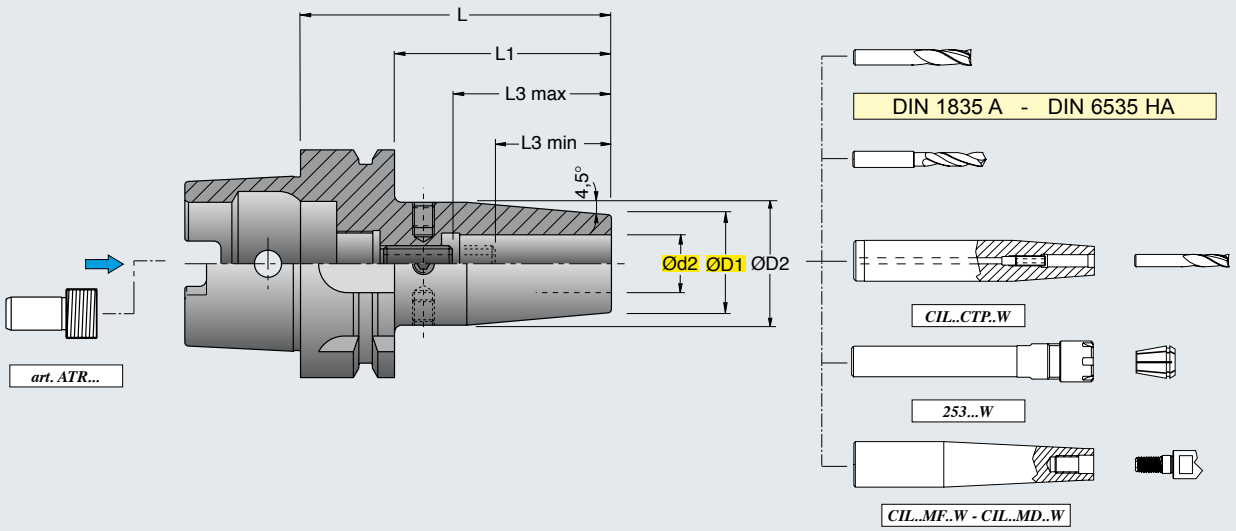
Utilizzare utensili con gambo cilindrico in tolleranza h6 o inferiore.
Use tools with cylinder shaft in h6 tolerance or lower.



FORNITO DI EQUILIBRATURA FINE IN CLASSE G 2,5

EQUIPPED WITH FINE-BALANCING IN CLASS G2,5

ART. HKA. ... .CT ...
DIN 69893 / A

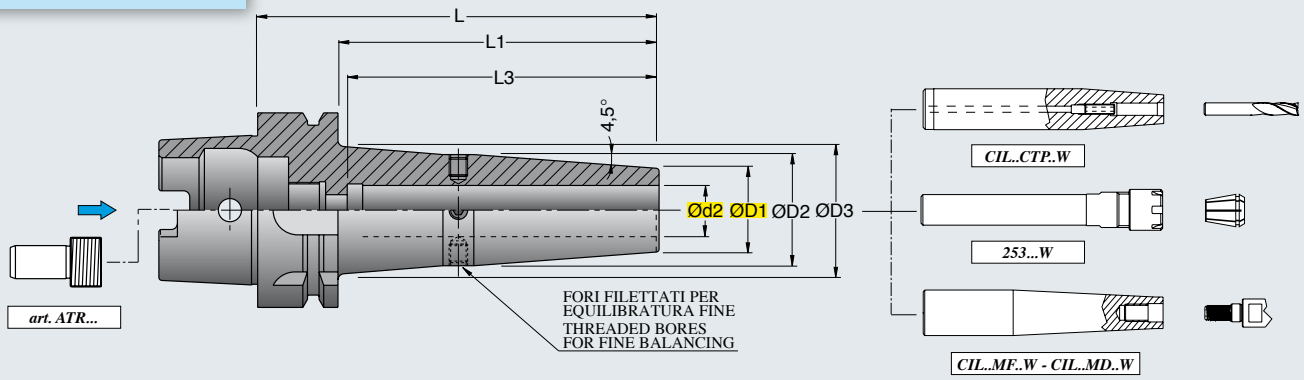


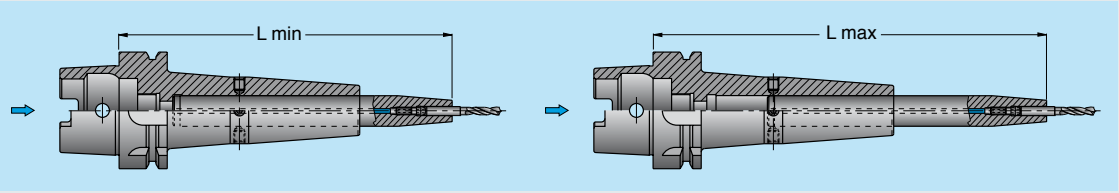
MANDRINO A CALETTAMENTO TERMICO
SHRINKING-ON TAPER SHANKS
WERKZEUGAUFNAHMEN MIT SCHRUMPFVERBINDUNG
MANDRIN À EMBOÎTEMENT THERMIQUE

EQUILIBRATO BALANCED
G 2,5 25000 min^{-1}

ART.		(mm) Ød2	ØD1	ØD2	L	L1	L3 max	L3 min		
HKA.063.CT006.080	HSK63	6	21	27	80	54	36	26	GWR 05	5025
HKA.063.CT006.160	HSK63	6	21	27	160	134	36	26		
HKA.063.CT008.080	HSK63	8	21	27	80	54	36	26	GWR 06	5003
HKA.063.CT008.160	HSK63	8	21	27	160	134	36	26		
HKA.063.CT010.085	HSK63	10	24	32	85	59	42	32	GWR 08CT	5004
HKA.063.CT010.160	HSK63	10	24	32	160	134	42	32		
HKA.063.CT012.090	HSK63	12	24	32	90	64	47	37	GWR 10CT	5005
HKA.063.CT012.160	HSK63	12	24	32	160	134	47	37		
HKA.063.CT014.090	HSK63	14	27	34	90	64	47	37		
HKA.063.CT014.160	HSK63	14	27	34	160	134	47	37		
HKA.063.CT016.095	HSK63	16	27	34	95	69	50	40	GWR 12CT	5005
HKA.063.CT016.160	HSK63	16	27	34	160	134	50	40		
HKA.063.CT018.095	HSK63	18	33	42	95	69	50	40		
HKA.063.CT018.160	HSK63	18	33	42	160	134	50	40		
HKA.063.CT020.100	HSK63	20	33	42	100	74	52	42	GWR 16CT	5008
HKA.063.CT020.160	HSK63	20	33	42	160	134	52	42		
HKA.063.CT025.115	HSK63	25	44	53	115	89	58	48		
HKA.063.CT025.160	HSK63	25	44	53	160	134	58	48		
HKA.063.CT032.120	HSK63	32	44	53	120	94	68	48		
HKA.100.CT006.085	HSK100	6	21	27	85	56	36	26	GWR 05	5025
HKA.100.CT006.160	HSK100	6	21	27	160	131	36	26		
HKA.100.CT008.085	HSK100	8	21	27	85	56	36	26	GWR 06	5003
HKA.100.CT008.160	HSK100	8	21	27	160	131	36	26		
HKA.100.CT010.090	HSK100	10	24	32	90	61	42	32	GWR 08CT	5004
HKA.100.CT010.160	HSK100	10	24	32	160	131	42	32		
HKA.100.CT012.095	HSK100	12	24	32	95	66	47	37	GWR 10CT	5005
HKA.100.CT012.160	HSK100	12	24	32	160	131	47	37		
HKA.100.CT014.095	HSK100	14	27	34	95	66	47	37		
HKA.100.CT014.160	HSK100	14	27	34	160	131	47	37		
HKA.100.CT016.100	HSK100	16	27	34	100	71	50	40	GWR 12CT	5005
HKA.100.CT016.160	HSK100	16	27	34	160	131	50	40		
HKA.100.CT018.100	HSK100	18	33	42	100	71	50	40		
HKA.100.CT018.160	HSK100	18	33	42	160	131	50	40		
HKA.100.CT020.105	HSK100	20	33	42	105	76	52	42	GWR 16CT	5008
HKA.100.CT020.160	HSK100	20	33	42	160	131	52	42		
HKA.100.CT025.115	HSK100	25	44	53	115	86	58	48		
HKA.100.CT025.160	HSK100	25	44	53	160	131	58	48		
HKA.100.CT032.120	HSK100	32	44	53	120	91	68	58		
HKA.100.CT032.160	HSK100	32	44	53	160	131	68	58		

ART. HKA. ... .CTP...
DIN 69893 / A





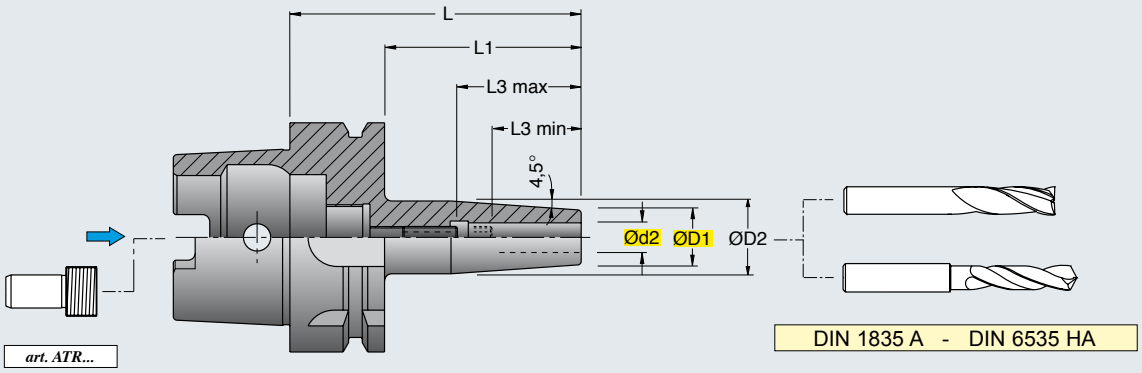
MANDRINO A CALETTAMENTO TERMICO PROLUNGABILE
EXTENSIBLE SHRINK FIT
VERLÄNGERBARES SCHRUMPFFUTTER
MANDRIN PROLONGEABLE À EMBOÎTEMENT THERMIQUE.

EQUILIBRATO BALANCED	
	G 2,5 25000 min⁻¹

ART.		(mm) Ød2	ØD1	ØD2	ØD3	L	L1	L3
HKA.063.CTP12.130	HSK63	12	24	32	38,5	130	104	100
HKA.063.CTP16.130	HSK63	16	27	36	41,5	130	104	100
HKA.063.CTP20.130	HSK63	20	33	42,5	–	130	104	100
HKA.063.CTP25.130	HSK63	25	44	52,5	–	130	104	100
HKA.100.CTP16.130	HSK100	16	27	36	41,5	130	101	100
HKA.100.CTP20.130	HSK100	20	33	42,5	–	130	101	100
HKA.100.CTP25.130	HSK100	25	44	52,5	–	130	101	100
HKA.100.CTP32.130	HSK100	32	44	52,5	–	130	101	100

ART. HKA.063.CT F...
DIN 69893 / A

NEW



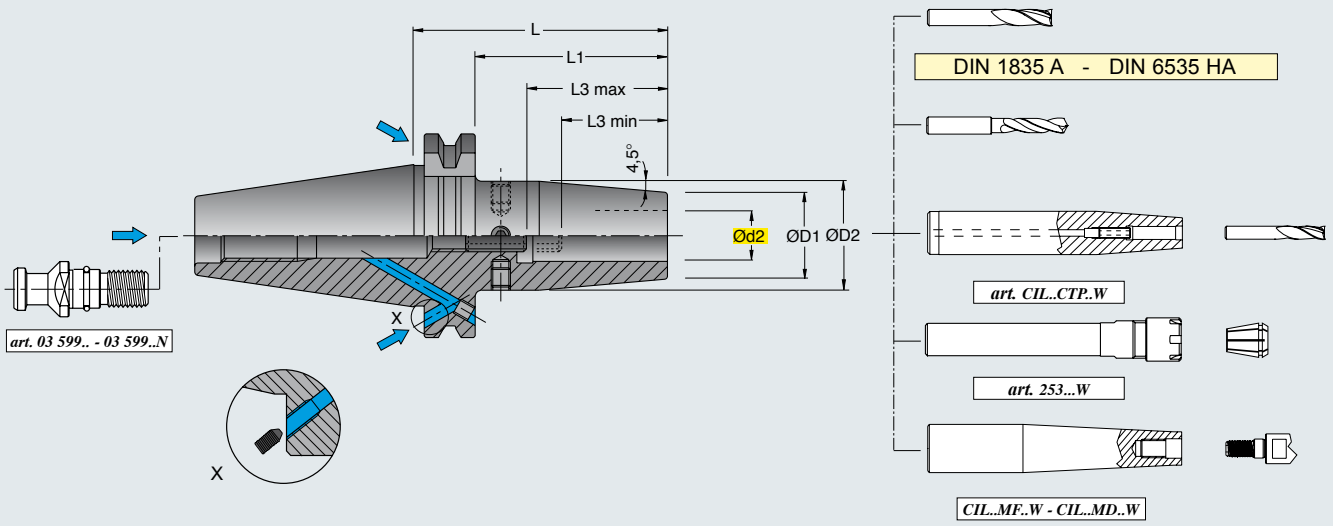
MANDRINO A CALETTAMENTO TERMICO DI FINITURA, INGOMBRO RIDOTTO
SHRINK FIT FOR FINISHING-REDUCED DIMENSIONS.
SCHRUMPFFUTTER ZUM SCHLICHTEN-KLEINER PLATZBEDARF
MANDRIN POUR FINISSAGE À EMBOÎTEMENT THERMIQUE-ENCOMBREMENT RÉDUIT.

EQUILIBRATO BALANCED
G 2,5 25000 min^{-1}

	ART.		(mm) Ød2	ØD1	ØD2	L	L1	L3 max	L3 min		
NEW	**HKA.063.CT F03.080**	HSK63	3	10	18	80	54	–	9	–	–
NEW	**HKA.063.CT F04.080**	HSK63	4	10	18	80	54	–	12		
NEW	**HKA.063.CT F05.080**	HSK63	5	10	18	80	54	–	15		
	HKA.063.CT F06.080	HSK63	6	15	20	80	54	36	26	GWR 05	5025
	HKA.063.CT F08.080	HSK63	8	15	20	80	54	36	26	GWR 06	5003
	HKA.063.CT F10.085	HSK63	10	18	25	85	59	42	32	GWR 08CT	5004
	HKA.063.CT F12.090	HSK63	12	18	25	90	64	47	37	GWR 10CT	5005

ART. SKB.040.CT...
ART. SKB.050.CT...M
DIN 69871 / A-AD-B

NEW

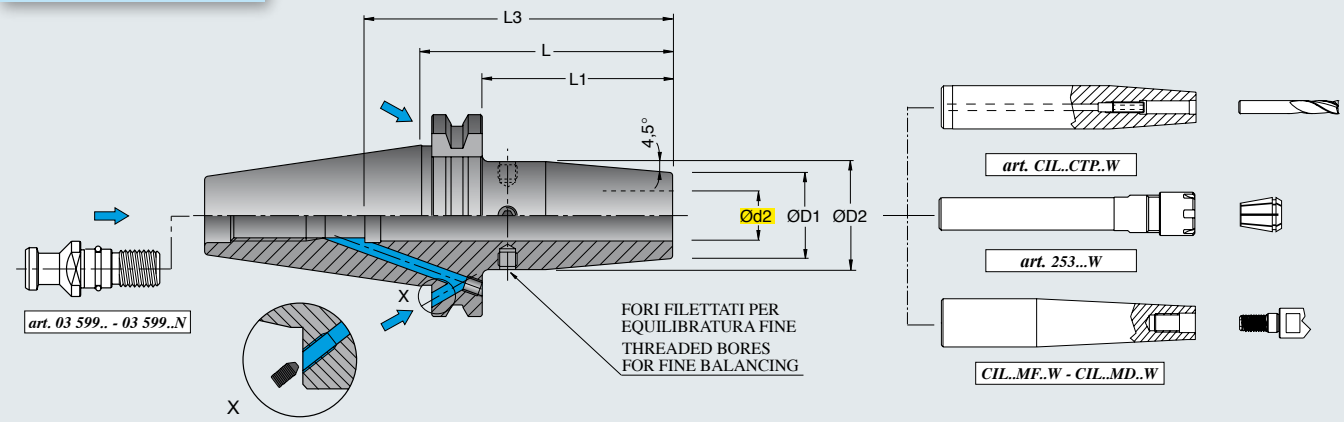


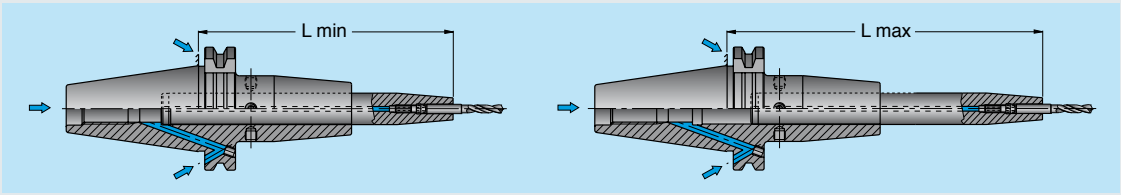
MANDRINO A CALETTAMENTO TERMICO
SHRINKING-ON TAPER SHANKS
WERKZEUGAUFNAHMEN MIT SCHRUMPFVERBINDUNG
MANDRIN À EMBOÎTEMENT TERMIQUE

EQUILIBRATO BALANCED
G 2,5 25000 min⁻¹

	ART.	(mm) Ød2	ØD1	ØD2	L	L1	L3 max	L3 min		
	SKB.040.CT006.080	ISO40 6	21	27	80	61	37	27	GWR 05	5025
	SKB.040.CT006.160	ISO40 6	21	27	160	141	37	27		
	SKB.040.CT008.080	ISO40 8	21	27	80	61	37	27	GWR 06	5003
	SKB.040.CT008.160	ISO40 8	21	27	160	141	37	27		
	SKB.040.CT010.080	ISO40 10	24	32	80	61	42	32	GWR 08CT	5004
	SKB.040.CT010.160	ISO40 10	24	32	160	141	42	32		
	SKB.040.CT012.080	ISO40 12	24	32	80	61	47	37	GWR 10CT	5005
	SKB.040.CT012.160	ISO40 12	24	32	160	141	47	37		
	SKB.040.CT014.080	ISO40 14	27	34	80	61	47	37		
	SKB.040.CT014.160	ISO40 14	27	34	160	141	47	37		
	SKB.040.CT016.080	ISO40 16	27	34	80	61	50	40	GWR 12CT	5005
	SKB.040.CT016.160	ISO40 16	27	34	160	141	50	40		
	SKB.040.CT018.080	ISO40 18	33	40,5	80	61	50	40		
	SKB.040.CT018.160	ISO40 18	33	40,5	160	141	50	40		
	SKB.040.CT020.080	ISO40 20	33	40,5	80	61	52	42	GWR 16CT	5008
	SKB.040.CT020.160	ISO40 20	33	40,5	160	141	52	42		
NEW	SKB.050.CT006.080M	ISO50 6	21	27	80	61	37	27	GWR 05	5025
NEW	SKB.050.CT006.160M	ISO50 6	21	27	160	141	37	27		
NEW	SKB.050.CT008.080M	ISO50 8	21	27	80	61	37	27	GWR 06	5003
NEW	SKB.050.CT008.160M	ISO50 8	21	27	160	141	37	27		
NEW	SKB.050.CT010.080M	ISO50 10	24	32	80	61	42	32	GWR 08CT	5004
NEW	SKB.050.CT010.160M	ISO50 10	24	32	160	141	42	32		
NEW	SKB.050.CT012.080M	ISO50 12	24	32	80	61	47	37	GWR 10CT	5005
NEW	SKB.050.CT012.160M	ISO50 12	24	32	160	141	47	37		
NEW	SKB.050.CT014.080M	ISO50 14	27	34	80	61	47	37		
NEW	SKB.050.CT014.160M	ISO50 14	27	34	160	141	47	37		
NEW	SKB.050.CT016.080M	ISO50 16	27	34	80	61	50	40	GWR 12CT	5005
NEW	SKB.050.CT016.160M	ISO50 16	27	34	160	141	50	40		
NEW	SKB.050.CT018.080M	ISO50 18	33	40.5	80	61	50	40		
NEW	SKB.050.CT018.160M	ISO50 18	33	40.5	160	141	50	40		
NEW	SKB.050.CT020.080M	ISO50 20	33	40.5	80	61	52	42	GWR 16CT	5008
NEW	SKB.050.CT020.160M	ISO50 20	33	40.5	160	141	52	42		
NEW	SKB.050.CT025.100M	ISO50 25	44	53	100	81	58	48		
NEW	SKB.050.CT025.160M	ISO50 25	44	53	160	141	58	48		
NEW	SKB.050.CT032.100M	ISO50 32	44	53	100	81	62	52		
NEW	SKB.050.CT032.160M	ISO50 32	44	53	160	141	62	52		

ART. SKB. .. .CTP...
DIN 69871 / A-AD-B





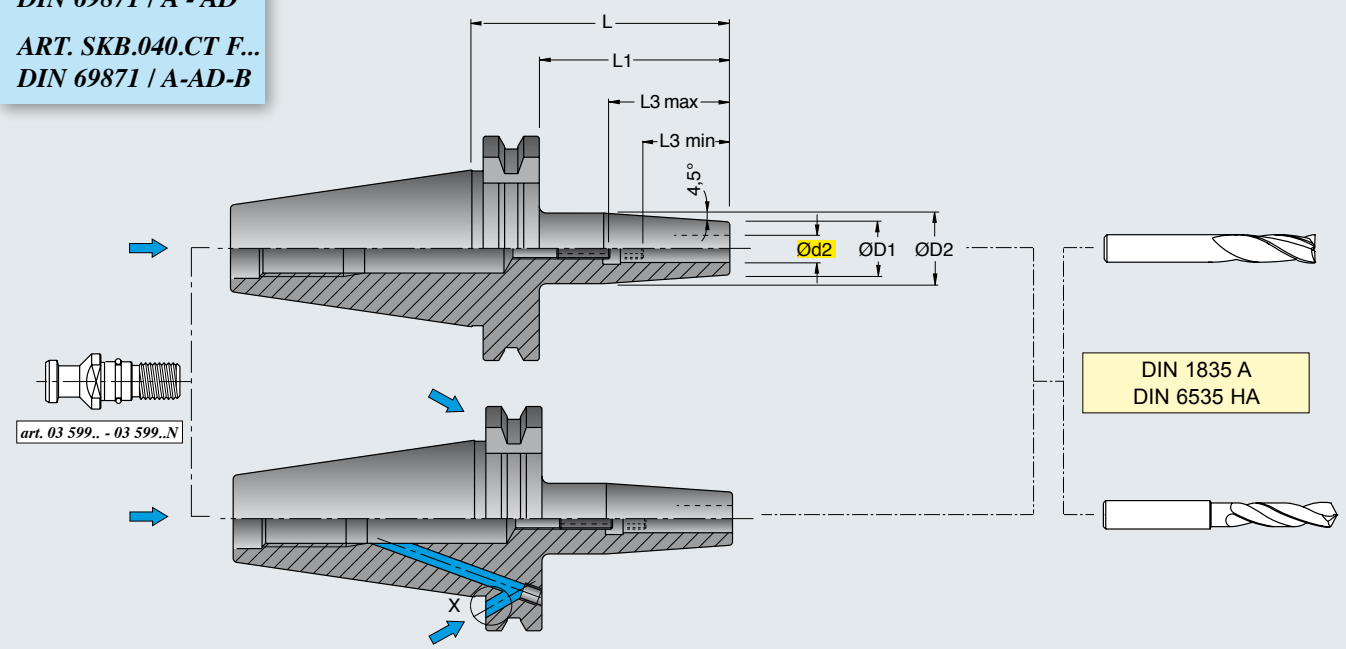
MANDRINO A CALETTAMENTO TERMICO PROLUNGABILE
EXTENSIBLE SHRINK FIT
VERLÄNGERBARES SCHRUMPFFUTTER
MANDRIN PROLONGEABLE À EMBOÎTEMENT THERMIQUE.

ART.		(mm) Ød2	ØD1	ØD2	L	L1	L3
SKB.040.CTP12.080	ISO40	12	24	32	80	61	115
SKB.040.CTP16.080	ISO40	16	27	34	80	61	115
SKB.040.CTP20.080	ISO40	20	33	42	80	61	115
SKB.040.CTP25.090	ISO40	25	41	50	90	71	115
SKB.050.CTP16.130	ISO50	16	27	34	130	111	160
SKB.050.CTP20.130	ISO50	20	33	42	130	111	160
SKB.050.CTP25.130	ISO50	25	44	53	130	111	160
SKB.050.CTP32.130	ISO50	32	44	53	130	111	160

ART. SKA.040.CT F...
DIN 69871 / A - AD

ART. SKB.040.CT F...
DIN 69871 / A-AD-B

NEW



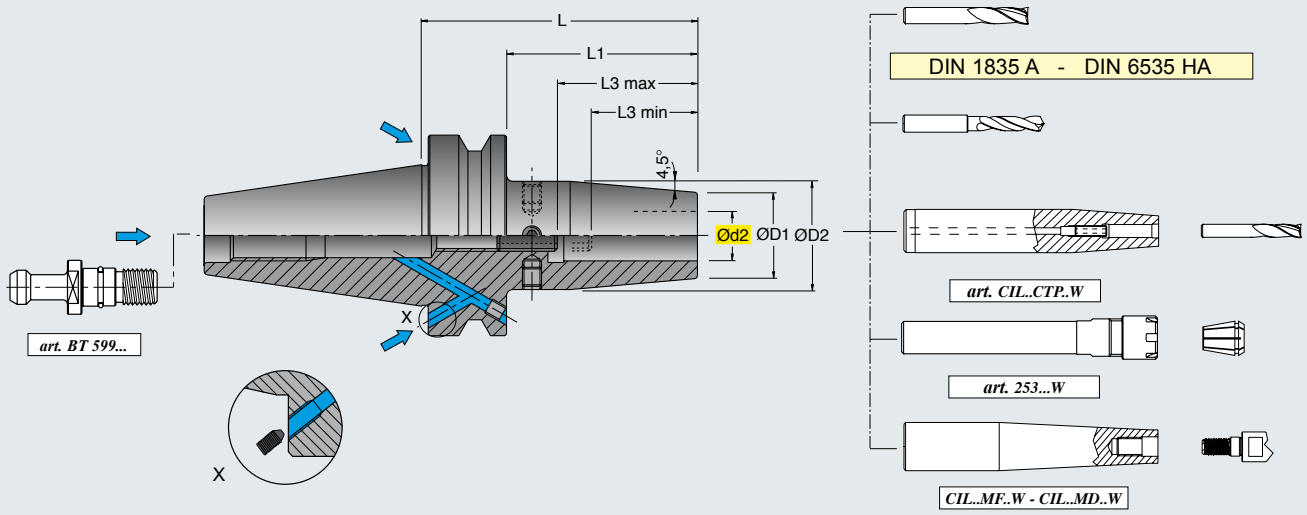
MANDRINO A CALETTAMENTO TERMICO DI FINITURA-INGOMBRO RIDOTTO
SHRINK FIT FOR FINISHING-REDUCED DIMENSIONS.
SCHRUMPFFUTTER ZUM SCHLICHTEN-KLEINER PLATZBEDARF
MANDRIN POUR FINISSAGE À EMBOÎTEMENT THERMIQUE-ENCOMBREMENT RÉDUIT.

EQUILIBRATO BALANCED
G 2,5 25000 min⁻¹

	ART.		(mm) Ød2	ØD1	ØD2	L	L1	L3 max	L3 min		
	SKA.040.CT F06.080	ISO40	6	15	20	80	53	36	26	GWR 05	5025
	SKA.040.CT F08.080	ISO40	8	15	20	80	53	36	26	GWR 06	5003
	SKA.040.CT F10.080	ISO40	10	18	25	80	53	42	32	GWR 08CT	5004
	SKA.040.CT F12.080	ISO40	12	18	25	80	53	47	37	GWR 10CT	5005
NEW	**SKB.040.CT F06.080**	ISO40	6	15	20	80	53	36	26	GWR 05	5025
NEW	**SKB.040.CT F08.080**	ISO40	8	15	20	80	53	36	26	GWR 06	5003
NEW	**SKB.040.CT F10.080**	ISO40	10	18	25	80	53	42	32	GWR 08CT	5004
NEW	**SKB.040.CT F12.080**	ISO40	12	18	25	80	53	47	37	GWR 10CT	5005

ART. BTB.040.CT...
ART. BTB.050.CT...M
MAS 403 BT/A-AD-B

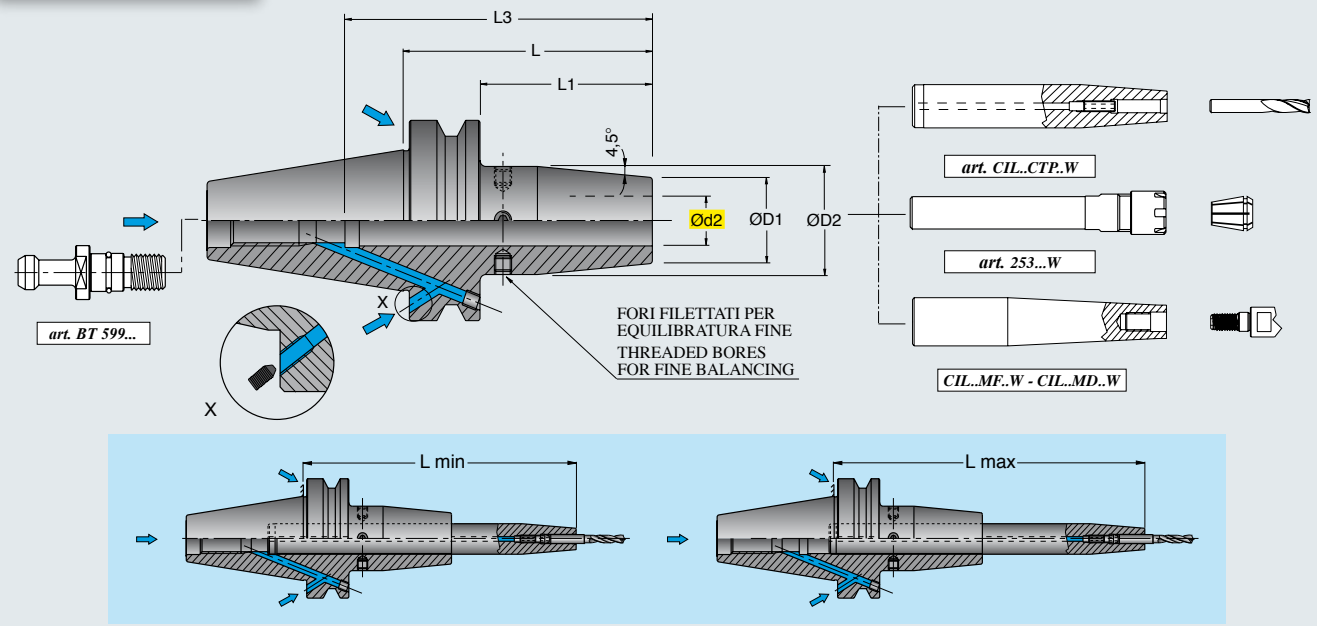
NEW



MANDRINO A CALETTAMENTO TERMICO
SHRINKING-ON TAPER SHANKS
WERKZEUGAUFNAHMEN MIT SCHRUMPFVERBINDUNG
MANDRIN À EMBOÎTEMENT THERMIQUE.

	ART.		(mm) Ød2	ØD1	ØD2	L	L1	L3 max	L3 min		
	BTB.040.CT006.090	ISO40	6	21	27	90	63	36	26	GWR 05	5025
	BTB.040.CT006.160	ISO40	6	21	27	160	133	36	26		
	BTB.040.CT008.090	ISO40	8	21	27	90	63	36	26	GWR 06	5003
	BTB.040.CT008.160	ISO40	8	21	27	160	133	36	26		
	BTB.040.CT010.090	ISO40	10	24	32	90	63	42	32	GWR 08CT	5004
	BTB.040.CT010.160	ISO40	10	24	32	160	133	42	32		
	BTB.040.CT012.090	ISO40	12	24	32	90	63	47	37	GWR 10CT	5005
	BTB.040.CT012.160	ISO40	12	24	32	160	133	47	37		
	BTB.040.CT014.090	ISO40	14	27	34	90	63	47	37		
	BTB.040.CT014.160	ISO40	14	27	34	160	133	47	37		
	BTB.040.CT016.090	ISO40	16	27	34	90	63	50	40	GWR 12CT	5005
	BTB.040.CT016.160	ISO40	16	27	34	160	133	50	40		
	BTB.040.CT018.090	ISO40	18	33	42	90	63	50	40		
	BTB.040.CT018.160	ISO40	18	33	42	160	133	50	40		
	BTB.040.CT020.090	ISO40	20	33	42	90	63	52	42	GWR 16CT	5008
	BTB.040.CT020.160	ISO40	20	33	42	160	133	52	42		
NEW	BTB.050.CT006.100M	ISO50	6	21	27	100	62	37	27	GWR 05	5025
NEW	BTB.050.CT006.160M	ISO50	6	21	27	160	122	37	27		
NEW	BTB.050.CT008.100M	ISO50	8	21	27	100	62	37	27	GWR 06	5003
NEW	BTB.050.CT008.160M	ISO50	8	21	27	160	122	37	27		
NEW	BTB.050.CT010.100M	ISO50	10	24	32	100	62	42	32	GWR 08CT	5004
NEW	BTB.050.CT010.160M	ISO50	10	24	32	160	132	42	32		
NEW	BTB.050.CT012.100M	ISO50	12	24	32	100	62	47	37	GWR 10CT	5005
NEW	BTB.050.CT012.160M	ISO50	12	24	32	160	132	47	37		
NEW	BTB.050.CT014.100M	ISO50	14	27	34	100	62	47	37		
NEW	BTB.050.CT014.160M	ISO50	14	27	34	160	132	47	37		
NEW	BTB.050.CT016.100M	ISO50	16	27	34	100	62	50	40	GWR 12CT	5005
NEW	BTB.050.CT016.160M	ISO50	16	27	34	160	122	50	40		
NEW	BTB.050.CT018.100M	ISO50	18	33	41	100	62	50	40		
NEW	BTB.050.CT018.160M	ISO50	18	33	41	160	122	50	40		
NEW	BTB.050.CT020.100M	ISO50	20	33	41	100	62	52	42	GWR 16CT	5008
NEW	BTB.050.CT020.160M	ISO50	20	33	41	160	122	52	42		
NEW	BTB.050.CT025.100M	ISO50	25	44	51	100	62	58	48		
NEW	BTB.050.CT025.160M	ISO50	25	44	51	160	122	58	48		
NEW	BTB.050.CT032.100M	ISO50	32	44	51	100	62	62	52		
NEW	BTB.050.CT032.160M	ISO50	32	44	51	160	122	62	52		

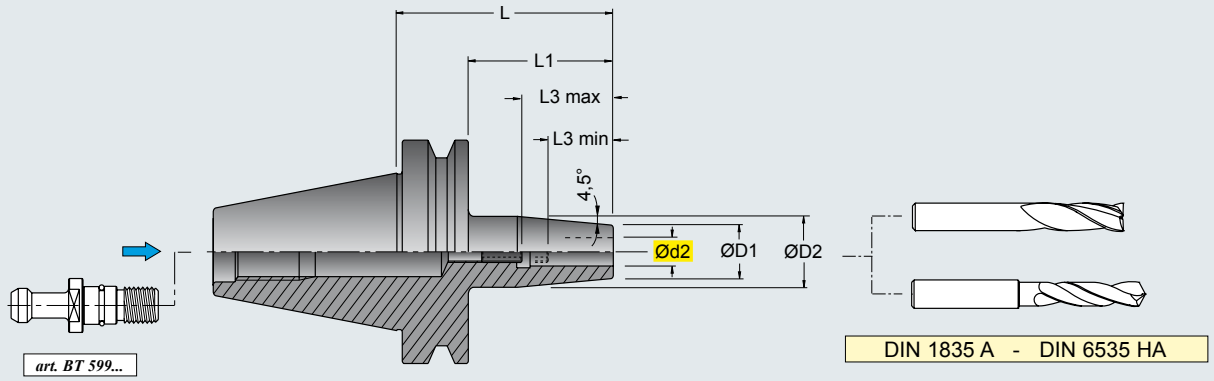
ART. BTB. ... .CTP...
MAS 403 BT/A-AD-B



MANDRINO A CALETTAMENTO TERMICO PROLUNGABILE
EXTENSIBLE SHRINK FIT
VERLÄNGERBARES SCHRUMPFFUTTER
MANDRIN PROLONGEABLE À EMBOÎTEMENT THERMIQUE.

ART.		(mm) Ød2	ØD1	ØD2	L	L1	L3
BTB.040.CTP12.090	ISO40	12	24	32	90	63	120
BTB.040.CTP16.090	ISO40	16	27	34	90	63	120
BTB.040.CTP20.090	ISO40	20	33	42	90	63	120
BTB.040.CTP25.100	ISO40	25	44	53	100	73	120
BTB.050.CTP16.130	ISO50	16	27	34	130	92	160
BTB.050.CTP20.130	ISO50	20	33	42	130	92	160
BTB.050.CTP25.130	ISO50	25	44	53	130	92	160
BTB.050.CTP32.130	ISO50	32	44	53	130	92	160

ART. BTA.040.CT F...
MAS 403 BT/A - AD

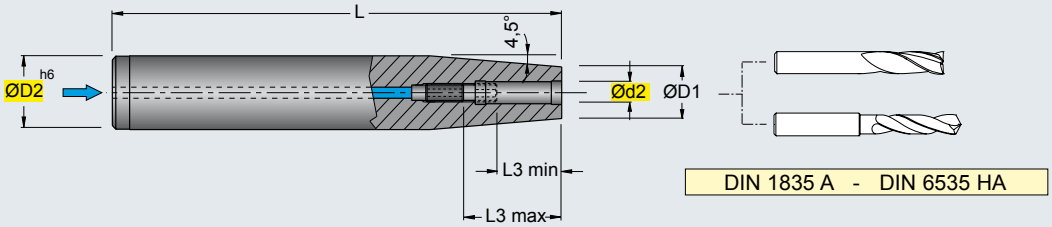


MANDRINO A CALETTAMENTO TERMICO DI FINITURA-INGOMBRO RIDOTTO
SHRINK FIT FOR FINISHING-REDUCED DIMENSIONS.
SCHRUMPFFUTTER ZUM SCHLICHTEN-KLEINER PLATZBEDARF
MANDRIN POUR FINISSAGE À EMBOÎTEMENT THERMIQUE-ENCOMBREMENT RÉDUIT.

EQUILIBRATO BALANCED
G 2,5 25000 min^{-1}

ART.		(mm) Ød2	ØD1	ØD2	L	L1	L3 max	L3 min		
BTA.040.CT F06.090	ISO40	6	15	20	90	63	36	26	GWR 05	5025
BTA.040.CT F08.090	ISO40	8	15	20	90	63	36	26	GWR 06	5003
BTA.040.CT F10.090	ISO40	10	18	25	90	63	42	32	GWR 08CT	5004
BTA.040.CT F12.090	ISO40	12	18	25	90	63	47	37	GWR 10CT	5005

ART. CIL. ... CTP ...W



PROLUNGA IN ACCIAIO CON ATTACCO A CALETTAMENTO TERMICO
STEEL SHRINK-FIT EXTENSION.
STAHLVERLÄNGERUNG MIT SCHRUMPFVERBINDUNG
RALLONGE EN ACIER AVEC ATTACHEMENT À EMBOÎTEMENT TERMIQUE

	ART.	(mm) Ød2	ØD1	h6 ØD2	L	L3 max	L3 min		
	CIL.012.CTP.003.160W	3	8	12	160	9,0	–	–	–
	CIL.012.CTP.004.160W	4	8	12	160	12,0	–		
	CIL.016.CTP.003.160W	3	10	16	160	9,0	–		
	CIL.016.CTP.004.160W	4	10	16	160	12,0	–		
	CIL.016.CTP.005.160W	5	10	16	160	15,0	–		
	CIL.016.CTP.006.130W	6	10	16	130	28,0	18,0	GWR 05	5025
	CIL.016.CTP.006.160W	6	10	16	160	28,0	18,0		
	CIL.020.CTP.006.130W	6	14	20	130	28,0	18,0		
	CIL.020.CTP.006.160W	6	14	20	160	28,0	18,0		
	CIL.020.CTP.008.130W	8	14	20	130	34,0	24,0	GWR 06	5003
	CIL.020.CTP.008.160W	8	14	20	160	34,0	24,0		
	CIL.025.CTP.008.130W	8	19	25	130	34,0	24,0		
	CIL.025.CTP.008.160W	8	19	25	160	34,0	24,0		
	CIL.025.CTP.008.200W	8	19	25	200	34,0	24,0		
	CIL.025.CTP.009.160W	9	19	25	160	34,0	24,0		
NEW	CIL.025.CTP.010.130W	10	20	25	130	42,0	32,0	GWR 08CT	5004
	CIL.025.CTP.010.160W	10	20	25	160	42,0	32,0		
	CIL.025.CTP.010.200W	10	20	25	200	42,0	32,0		
	CIL.025.CTP.011.160W	11	20	25	160	42,0	32,0		
NEW	CIL.025.CTP.012.130W	12	20	25	130	47,0	37,0	GWR 10CT	5005
	CIL.025.CTP.012.160W	12	20	25	160	47,0	37,0		
	CIL.025.CTP.012.200W	12	20	25	200	47,0	37,0		
	CIL.025.CTP.014.160W	14	22	25	160	47,0	37,0	GWR 12CT	5005
	CIL.025.CTP.016.130W	16	22	25	130	50,0	40,0		
	CIL.025.CTP.016.160W	16	22	25	160	50,0	40,0		
	CIL.025.CTP.016.200W	16	22	25	200	50,0	40,0		
	CIL.032.CTP.012.130W	12	27	32	130	47,0	37,0	GWR 10CT	5005
	CIL.032.CTP.012.160W	12	27	32	160	47,0	37,0		
	CIL.032.CTP.012.200W	12	27	32	200	47,0	37,0		
	CIL.032.CTP.016.130W	16	27	32	130	50,0	40,0	GWR 12CT	5005
	CIL.032.CTP.016.160W	16	27	32	160	50,0	40,0		
	CIL.032.CTP.016.200W	16	27	32	200	50,0	40,0		
	CIL.032.CTP.018.160W	18	27	32	160	50,0	40,0		
	CIL.032.CTP.020.130W	20	27	32	130	52,0	42,0		
	CIL.032.CTP.020.160W	20	27	32	160	52,0	42,0		
	CIL.032.CTP.020.200W	20	27	32	200	52,0	42,0		

MACCHINA PER IL CALETTAMENTO TERMICO CON SISTEMA A INDUZIONE MAGNETICA
THERMAL COUPLING MACHINE WITH MAGNETIC INDUCTION SYSTEM.
SCHRUMPFVERFAHRENMASCHING MIT MAGNETISCHEM INDUKTIONSSYSTEM
MACHINE POUR LE FRETTAGE TERMIQUE AVEC SYSTEMÈ À INDUCTION MAGNÉTIQUE.

ART. MCT 332A

Generatore di potenza
Power generator
Leistungsgenerator
Générateur de puissance:

- 16 Ampere
- 3 x 400 Volt -50 Hz
- **10 Kw**

Dimensioni
Dimensions
Abmessungen
Dimensions:

ca. 510 x 470 x 160 mm

Peso
Weight
Gewicht
Poids:

kg ≅ 20

ADATTA PER CALETTARE UTENSILI, PROLUNGHE E ACCESSORI IN ACCIAIO E IN METALLO DURO CON ATTACCO CILINDRICO h6 DA Ø3 A Ø32

SUITABLE FOR THE SHRINKING-ON OF TOOLS, EXTENSIONS AND ACCESSORIES IN STEEL AND SOLID CARBIDE WITH CYLINDER SHAFT h6 FROM Ø3 TO Ø32

ACCESSORI IN DOTAZIONE
ACCESSORIES SUPPLIED

N° 4 dischi in dotazione
4 disks supplied

Dischi di arresto e centraggio
Grip and centering disks

	COD.
Ø3 - Ø6	RCT DISCT 003006
Ø6 - Ø12	RCT DISCT 006012
Ø14 - Ø20	RCT DISCT 014020
Ø25 - Ø32	RCT DISCT 025032

ACCESSORI OPZIONALI
OPTIONAL ACCESSORIES

Articolo opzionale a richiesta
Optional item available on request

Dischi di bloccaggio mandrini
Taper shank locking disks

	COD.
ISO 40	ACT 110 ISO40
ISO 50	ACT 110 ISO50
HK 40	ACT 110 HK40
HK 50	ACT 110 HK50
HK 63	ACT 110 HK63
HK 80	ACT 110 HK80
HK 100	ACT 110 HK100

ACCESSORI OPZIONALI - OPTIONAL ACCESSORIES

Articolo opzionale a richiesta
Optional item available on request

Guanti
Gloves

COD.

ACT GUANTI 300

Articolo opzionale a richiesta
Optional item available on request

Dissipatore di calore
Heat sink

COD.

ADC KIT CT 032006

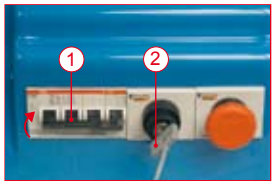
ISTRUZIONI D'USO - *INSTRUCTIONS FOR USE*

Scegliere il disco di bloccaggio adatto al mandrino da calettare. Sgrassare e pulire il mandrino da calettare prima del suo utilizzo.

Choose the locking disk suitable for the taper shank to be shrinked-on. Degrease and clean the taper shank to be shrinked-on before using it.

Inserire nella bobina di induzione il disco di arresto appropriato all'utensile da calettare, per ottenere un posizionamento corretto dell'induttore sopra al mandrino

Insert the grip disk suitable for the taper shank to be shrinked-on into the induction coil to achieve a correct positioning of the inductor over the taper shank



Accendere la macchina mediante l'interruttore generale (1). Armare l'interruttore di potenza (2).
Tramite la tastiera e il display (3) scegliere: la modalità di raffreddamento, il tipo di mandrino CT,CTP,CTF e il diametro del mandrino da calettare.

Switch on the machine with the main swich (1). Arm the power switch (2). By means of the keyboard and the display (3) choose: the cooling mode, the mandrel type CT,CTP,CTF and the diameter of the taper shank to be shrinked-on.

Inserire correttamente la bobina di induzione sopra il mandrino da calettare e inserire l'utensile del giusto diametro da calettare

Insert the induction coil properly over the taper shank to be shrinked-on and introduce the tool with the proper diameter to be shrinked-on.

Tenere premuto il pulsante di start sulla bobina finché l'utensile non entra nel mandrino.
Al rilascio del pulsante di start inizia il raffreddamento impostato.

Hold the start button on the coil pressed until the tool is inserted into the taper shank. Upon releasing the start button, the set cooling mode is activated

VANTAGGI - *ADVANTAGES*

1. Unica bobina di induzione magnetica per tutti i diametri
2. Inserimento utensile in meno di 5 sec.
3. Nessun surriscaldamento dei mandrini con minore sollecitazione termica e minore tempo di raffreddamento
4. Utilizzo molto semplice, senza rinunciare alle svariate possibilità d'impiego
5. Ciclo automatico programmato e/o manuale
6. Software predisposto per gestire differenti sistemi di raffreddamento alternativi
7. Predisposta meccanicamente per collegare un sistema supplementare di raffreddamento per contatto
8. Ottimo rapporto prezzo prestazioni
9. Massima praticità nell'utilizzo, senza vincoli dati da strutture inutili
10. Bobina induttiva con raffreddamento interno che garantisce una maggiore efficienza ed affidabilità
11. Raffreddamento forzato del generatore di potenza per una maggiore durata nel tempo

1. Single magnetic induction coil for all size
2. Tool insertion in less than 5 seconds
3. No overheating of the taper shanks with little thermal stress and less cooling time
4. Very simple to use without giving up varied machining possibilities
5. Programmed automatic cycle and/or manual cycle
6. Software arranged to handle various alternative cooling systems
7. Mechanically equipped to connect an additional contact cooling system
8. Excellent price/performance value for your money
9. Pratical to use; no slowing down work due to useless structures
10. Inductive coil with internal cooling guaranteeing greater efficiency and reliability
11. Forced cooling of the power generator for a longer period of time

ART. MCT 332B

NEW

La MCT 332B rappresenta la naturale evoluzione della MCT 332A che, con l'applicazione di un montante pneumatico, consente di operare disimpegnandosi dal sostenere manualmente la bobina ad induzione.
Grazie ad un comando a bordo macchina di avvio/stop si può controllare più precisamente il posizionamento della bobina sul punto di calettamento.
La macchina è adatta per calettare utensili, prolunghe e accessori in acciaio e in metallo duro con attacco cilindrico h6 da ø3 a ø32

The MCT 332B is the natural evolution of the MCT 332A which, by the addition of a pneumatic vertical rod, allows work to be carried out without manually holding up the induction coil.
By using the stop/start button on the machine the position of the coil on the shrinking on point can be controlled more precisely.

Generatore di potenza
Power generator
Leistungsgenerator
Générateur de puissance:

- 16 Ampere
- 3 x 400 Volt -50 Hz
- **10 Kw**

Dimensioni
Dimensions
Abmessungen
Dimensions:

ca. 650 x 530 x 890 mm

Peso
Weight
Gewicht
Poids:

kg ≅ 28

Corsa massima montante
Vertical rod maximum stroke
Maximaler ständerhub
Course maxi montant:

h = 490 mm

ACCESSORI IN DOTAZIONE
ACCESSORIES SUPPLIED

N° 4 dischi in dotazione
4 disks supplied

Dischi di arresto e centraggio
Grip and centering disks

	COD.
Ø3 - Ø6	RCT DISCT 003006
Ø6 - Ø12	RCT DISCT 006012
Ø14 - Ø20	RCT DISCT 014020
Ø25 - Ø32	RCT DISCT 025032

ACCESSORI OPZIONALI
OPTIONAL ACCESSORIES

Articolo opzionale a richiesta
Optional item available on request

Dischi di bloccaggio mandrini
Taper shank locking disks

	COD.
ISO 40	ACT 110 ISO40
ISO 50	ACT 110 ISO50
HK 40	ACT 110 HK40
HK 50	ACT 110 HK50
HK 63	ACT 110 HK63
HK 80	ACT 110 HK80
HK 100	ACT 110 HK100

ACCESSORI OPZIONALI - *OPTIONAL ACCESSORIES*

Articolo opzionale a richiesta
Optional item available on request

Guanti
Gloves

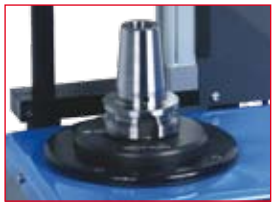
COD.
ACT GUANTI 300

Articolo opzionale a richiesta
Optional item available on request

Dissipatore di calore
Heat sink

COD.
ADC KIT CT 032006

ISTRUZIONI D'USO - *INSTRUCTIONS FOR USE*

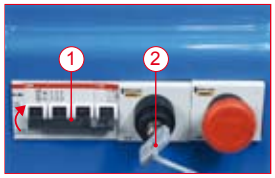


Scegliere il disco di bloccaggio adatto al mandrino da calettare. Sgrassare e pulire il mandrino da calettare prima del suo utilizzo.

Choose the locking disk suitable for the taper shank to be shrinked-on. Degrease and clean the taper shank to be shrinked-on before using it.

Inserire nella bobina di induzione il disco di arresto appropriato all'utensile da calettare, per ottenere un posizionamento corretto dell'induttore sopra al mandrino

Insert the grip disk suitable for the taper shank to be shrinked-on into the induction coil to achieve a correct positioning of the inductor over the taper shank

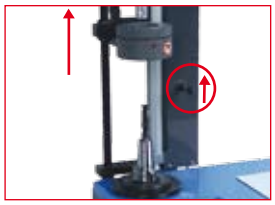


Accendere la macchina mediante l'interruttore generale (1). Armare l'interruttore di potenza (2).
Tramite la tastiera e il display (3) scegliere: la modalità di raffreddamento, il tipo di mandrino CT,CTP,CTF e il diametro del mandrino da calettare.

Switch on the machine with the main swich (1). Arm the power switch (2). By means of the keyboard and the display (3) choose: the cooling mode, the mandrel type CT,CTP,CTF and the diameter of the taper shank to be shrinked-on.

Azionare la leva verso il basso per posizionare la bobina di induzione sul mandrino da calettare.
Tenere premuto il pulsante start sulla tastiera della macchina finchè l'utensile non entra nel mandrino.
Al rilascio del pulsante di start inizia il raffreddamento impostato.

Pull the lever down to position the induction coil on the arbor to be shrunk.
Hold the start button down on the machine keyboard until the tool enters the arbor.
When the start button is released, the programmed cooling begins.



Azionare la leva verso l'alto per spostare la bobina di induzione in posizione di riposo

Pull the lever up to move the induction coil into the rest position

VANTAGGI - *ADVANTAGES*

1. Unica bobina di induzione magnetica per tutti i diametri
2. Inserimento utensile in meno di 5 sec.
3. Nessun surriscaldamento dei mandrini con minore sollecitazione termica e minore tempo di raffreddamento
4. Utilizzo molto semplice
5. Ciclo automatico programmato e/o manuale
6. Software predisposto per gestire differenti sistemi di raffreddamento alternativi
7. Predisposta meccanicamente per collegare un sistema supplementare di raffreddamento per contatto
8. Ottimo rapporto prezzo prestazioni
9. Massima praticità nell'utilizzo, senza vincoli dati da strutture inutili
10. Bobina induttiva con raffreddamento interno che garantisce una maggiore efficienza ed affidabilità
11. Raffreddamento forzato del generatore di potenza per una maggiore durata nel tempo

1. Single magnetic induction coil for all size
2. Tool insertion in less than 5 seconds
3. No overheating of the taper shanks with little thermal stress and less cooling time
4. Very simple to use
5. Programmed automatic cycle and/or manual cycle
6. Software arranged to handle various alternative cooling systems
7. Mechanically equipped to connect an additional contact cooling system
8. Excellent price/performance value for your money
9. Pratical to use; no slowing down work due to useless structures
10. Inductive coil with internal cooling guaranteeing greater efficiency and reliability
11. Forced cooling of the power generator for a longer period of time

ART. URR-01

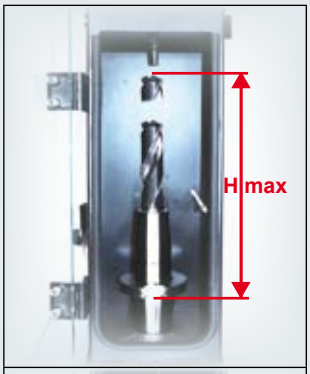
NEW

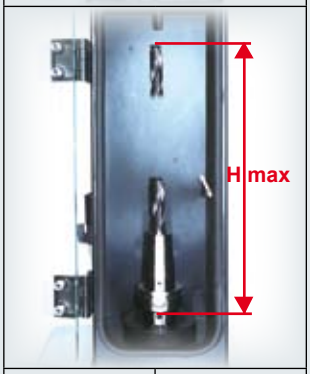
L'URR è un dispositivo innovativo di facile uso per il raffreddamento rapido di utensili e mandrini di calettamento.
Il funzionamento della URR si basa su un circuito pneumatico semiautomatico.
Avviando il ciclo di raffreddamento il liquido refrigerante sale nella colonna sommergendo il mandrino.
La durata massima del ciclo, alimentando la macchina a 6 bar, è di circa 30sec.
Il ciclo può comunque essere interrotto in qualsiasi istante

The URR is an innovative, easy to use device for quick cooling of shrink-fit tools and arbors. URR operation is based on a semi-automatic pneumatic circuit.
When the cooling cycle is started up, the coolant rises up the columm to submerge the arbor. Maximum cycle duration, when the machine is powered at 6 bar, is approximately 30 seconds. The cycle may be interrupted at any time.

Dimensioni
Dimensions
Abmessungen
Dimensions:
ca. 325 x 510 x 670 mm

Peso
Weight
Gewicht
Poids:
kg ≅ 25





	H max
HSK063	340 mm
HSK100	320 mm
ISO40	380 mm
ISO50	320 mm

***ACCESSORI IN DOTAZIONE** - ACCESSORIES SUPPLIED*

Misure 32 ÷ 100
Dimensions 32 ÷ 100

Supporto Mandrini HSK
HSK Arbor Support

	COD.
	AUR HSK

Contenitore da 1L
1L Container Protective Coolant

Liquido protettivo di raffreddamento
Protective cooling liquid

	COD.
	AUR LPR 1L

***ACCESSORI OPZIONALI** - OPTIONAL ACCESSORIES*

Articolo opzionale a richiesta
Optional item available on request

Tubo a spirale con pistola per aria
Spiral hose with air gun

COD.
AUR TSP

Articolo opzionale a richiesta
Optional item available on request

Tubo a spirale per connessione aria principale
Spiral hose for main air connection

COD.
AUR TSA

ISTRUZIONI D'USO - *INSTRUCTIONS FOR USE*

Riempire la vasca con circa 12,5 litri di liquido refrigerante (soluzione acqua+liquido protettivo AUR LPR 1L 3÷5%), versandolo attraverso la rete di protezione (1).
Collegare la macchina alla rete dell'aria compressa (2).

Fill the tank with approximately 12,5 litres of coolant (solution of water+protective liquid AUR LPR 1L 3÷5%), pouring it through the protection mesh (1).
Connect the machine to the compressed air system (2).

Se si desidera raffreddare mandrini HSK, scegliere l'alloggio AUR HSK (1).
Se si desidera raffreddare invece mandrini con cono ISO 40, ISO 50, posizionare il mandrino nella bussola interna alla macchina (2).

To cool HSK arbors choose the AUR HSK housig (1).
However, to cool arbors with ISO 40 or ISO 50 cone, place the arbor in the machine's internal bushing (2).

Chiudere lo sportello e ruotare la leva verso "START" che si trova sul lato destro della colonna.
Il ciclo automatico si è avviato e durerà circa 30 sec; assieme al ciclo si attiva anche la protezione anti-apertura dello sportello. In qualsiasi istante è possibile interrompere il ciclo ruotando la stessa leva verso "STOP".

Close the door and rotate the lever towards "START", which is on the right-hand side of the columm.
The automatic cycle starts and will last approximately 30 sec; the door's anti-opening protection is also enabled together with the cycle. It is possible to interrupt the cycle at any time by turning the same lever to "STOP".

Attendere la fine del ciclo e quindi che tutto il liquido refrigerante sia rientrato nella vasca. Dopo ciò, è possibile sbloccare lo sportello ed attivare il soffio per la pulizia del liquido refrigerante residuo sul mandrino mediante il pulsante situato sul lato sinistro della colonna.

Await the end of the cycle and therefore that all the coolant liquid has returned to the tank. After which it is possible to activate the air jet in order to clean any residual coolant on the arbor using the button on the left-hand side of the column and release the door.

È necessario sempre premere il pulsante a fine ciclo per disattivare la protezione anti-apertura dello sportello.
Estrarre il mandrino raffreddato pronto per l'utilizzo.

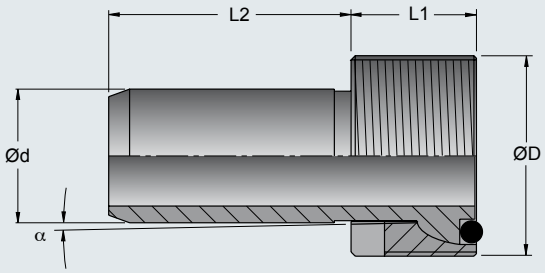
It is always necessary to press the button at the end of a cycle in order to deactivate the door anti-opening protection.
Extract the cooled arbor ready for use.

VANTAGGI - *ADVANTAGES*

1. **Utilizza una miscela aria/emulsione protettiva che raffredda rapidamente il mandrino preservandolo nel contempo da agenti corrosivi ad ogni ciclo di calettamento**
2. **Il tempo di raffreddamento è di max. 30 secondi ma può essere interrotto manualmente**
3. **Non necessita di alimentazione elettrica in quanto il suo funzionamento avviene mediante aria compressa a 6 bar con conseguenti caratteristiche di semplicità di uso e manutenzione, economicità e sicurezza**
4. **Non viene impegnata l'unità di calettamento nell'operazione di raffreddamento del portautensile consentendo un numero maggiore di cicli di calettamento nell'unità di tempo**

1. It uses a protective air/emulsion mix that rapidly cools the arbor, thus protecting it against corrosive agents at each shrinking cycle.
2. The cooling time is of max. 30 secs. , but it can be interrupted manually
3. It does not require electric powering as it works on compressed air at 6 bar, with the consequential characteristics of simplicity of use and maintenance, savings and safety.
4. The shrink-fit unit is not involved in the toolholder cooling operation, thus allowing a greater number of shrinking cycles by the unit over time.

ART. ATR ...

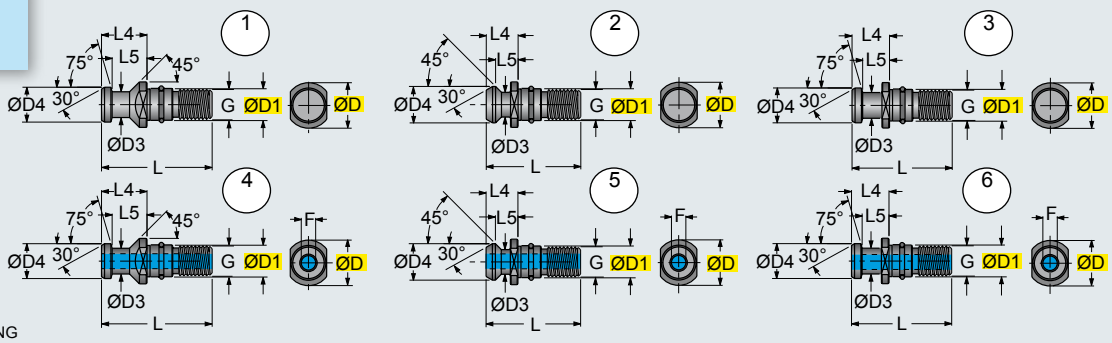


ADDUTTORE REFRIGERANTE PER MANDRINI HSK
COOLANT FEED FOR HSK CHUCK
KÜHLMITTELZUFHUR FÜR HSK-AUFNAHME
ABDUCTEUR DU RÈFRIGÈRANTE POUR MANDRINS HSK

ART.		(mm) ØD	Ød	L1	L2	α		
ATR010 HK32	HSK 32	M10x1	6	6	26	–	OR-HK032	–
ATR012 HK40	HSK 40	M12x1	8	8	21,5	–	OR-HK040	–
ATR016 HK50	HSK 50	M16x1	10	10	23	–	OR-HK050	–
ATR018 HK63	HSK 63	M18x1	12	11,5	36,2	1,3°	OR-HK063	CH-HK063
ATR020 HK80	HSK 80	M20x1,5	14	13,5	39,7	1,4°	OR-HK080	CH-HK080
ATR024 HK100	HSK 100	M24x1,5	16	15	43,6	1,4°	OR-HK100	CH-HK100

ART. 03 599 ...
ART. 03 599 ...N

DIN 69872
ISO 7388/2 A-B

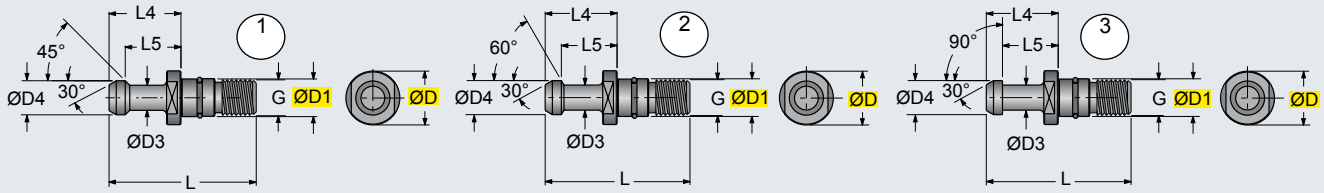


TIRANTE CON GUARNIZIONE
TENSION ROD WITH PACKING
ANZUGSBOLZEN MIT DICHTUNG
TIRANT AVEC GARNITURE

ART.		(mm) ØD	ØD1	ØD3	ØD4	L	L4	L5	G	F	FIGURA FIGURE BILD FIGURE	
03 599.040.01 DIN	ISO40	23,0	17	14,0	19,0	54,0	26,0	20,0	M16	7,0	4	DIN 69872 A
03 599.050.05 DIN	ISO50	36,0	25	21,0	28,0	74,0	34,0	25,0	M24	11,5	4	
03 599.040.01 ISO	ISO40	23,0	17	14,0	19,0	54,0	26,0	20,0	M16	7,0	6	ISO 7388/2 A
03 599.050.05 ISO	ISO50	36,0	25	21,0	28,0	74,0	34,0	25,0	M24	11,5	6	
03 599.040.02	ISO40	22,5	17	12,95	18,95	44,5	16,4	11,15	M16	7,35	5	ISO 7388 A
03 599.050.06	ISO50	37,0	25	19,6	29,1	65,5	25,55	17,95	M24	11,55	5	
03 599.040.01N DIN	ISO40	23,0	17	14,0	19,0	54,0	26,0	20,0	M16	7,0	1	DIN 69872 B
03 599.050.05N DIN	ISO50	36,0	25	21,0	28,0	74,0	34,0	25,0	M24	11,5	1	
03 599.040.01N ISO	ISO40	23,0	17	14,0	19,0	54,0	26,0	20,0	M16	7,0	3	ISO 7388/2 B
03 599.050.05N ISO	ISO50	36,0	25	21,0	28,0	74,0	34,0	25,0	M24	11,5	3	
03 599.040.02N	ISO40	22,5	17	12,95	18,95	44,5	16,4	11,15	M16	7,35	2	ISO 7388 B
03 599.050.06N	ISO50	37,0	25	19,6	29,1	65,5	25,55	17,95	M24	11,55	2	

ART. BT 599 ...

JIS B 6339/BT



TIRANTE CON GUARNIZIONE
TENSION ROD WITH PACKING
ANZUGSBOLZEN MIT DICHTUNG
TIRANT AVEC GARNITURE

ART.		(mm) ØD	ØD1	ØD3	ØD4	L	L4	L5	G	FIGURA FIGURE BILD FIGURE
BT 599.040.01	ISO40	23	17	10	15	60	35	28	M16	1
BT 599.040.02	ISO40	23	17	10	15	60	35	28	M16	2
BT 599.040.03	ISO40	23	17	10	15	60	35	28	M16	3
BT 599.050.05	ISO50	38	25	17	23	85	45	35	M24	1
BT 599.050.06	ISO50	38	25	17	23	85	45	35	M24	2
BT 599.050.07	ISO50	38	25	17	23	85	45	35	M24	3

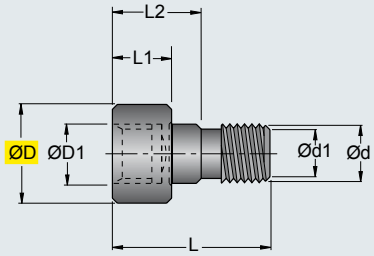
N.B. IL TIRANTE PUO' ESSERE FORNITO FORATO SU RICHIESTA DEL CLIENTE CHE NE SPECIFICHI IL DIAMETRO DEL FORO. NATURALMENTE SI DECLINA OGNI RESPONSABILITA'.

N.B. THE RETENTION SCREEN CAN BE SUPPLIED CUSTON-DRILLED TO SPECIFICATIONS OF THE CUSTOM.(WE DECLINE RESPONSIBILITY FOR CUSTOM ORDERS)

N.B. DURCHBOHRTE ANZUGSBOLZEN KOENNEN NACH SPEZIFISCH VON DEN KUNDEN ANGEGEBENEN DURCHMESSER GROESSEN AUCH GELIEFERT WERDEN.SELBSTVERSTAENDLICH WIRD JEGLICHE VERANTWORTUNG ABGELEHNT.

N.B. LE TIRANT PEUT ETRE LIVRE SUR DEMANDE DU CLIENT QUI SPECIFIERA LE DIAMETRE DU TROU-NATURELLEMENT ON DECLINE TOUTE RESPONSABILITE.

ART. 599 ...



CODOLO DI TRASFORMAZIONE DA BT A DIN 2080
ADAPTER BT-DIN 2080
ADAPTERSCHAFT BT-DIN 2080
TIRETTE DE TRANSFORMATION À PARTIR DE BT EN DIN 2080

ART.		(mm) ØD	ØD1	Ød	Ød1	L	L1	L2
599.240.140.002	ISO40	25	M16	17	M16	55	25	33
599.250.150.002	ISO50	39	M24	25	M24	65	25	36

- L' ATTACCO **BT** PUO' ESSERE TRASFORMATO IN **DIN 2080** CON CODOLO : **IS0 40 = ART.599.240.140.002 , IS0 50 = ART.599.250.150.002 ;** MA NON E' SEMPRE POSSIBILE UN ADATTAMENTO AUTOMATICO SULLA MACCHINA.

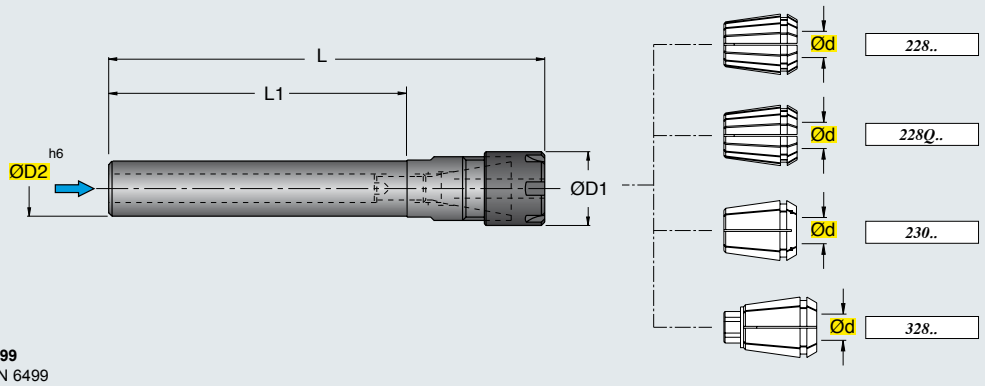
- BT ATTACHMENT CAN BE TRANSFORMED IN **DIN 2080** WITH SHAFT : **IS0 40 = ART.599.240.140.002 , IS0 50 = ART.599.250.150.002 ;** BUT AN AUTOMATIC ADAPTATION ISN'T ALWAYS POSSIBLE ON THE MACHINE.

- DIE BT AUFNAHME KANN IN DIN 2080 UMGEWANDELT WERDEN UND ZWAR MIT SCHAFT : **IS0 40 = ART.599.240.140.002 , IS0 50 = ART.599.250.150.002 ; DIE** AUTOMATISCHE ANPASSUNG DER MASCHINE IST JEDOCH NICHT IMMER MÖGLICH.

- L'ATTACHEMENT BT PEUT ÊTRE TRANSFORMÉ EN DIN 2080 AVEC QUEUE DE TRANSFORMATION : **IS0 40 = ART.599.240.140.002 , IS0 50 = ART.599.250.150.002 ;** MAIS CE N'EST PAS TOUJOURS POSSIBLE L'ADAPTAMENT AUTOMATIQUE SUR LA MACHINE.

ART. 253 ... W

ER-DIN 6499

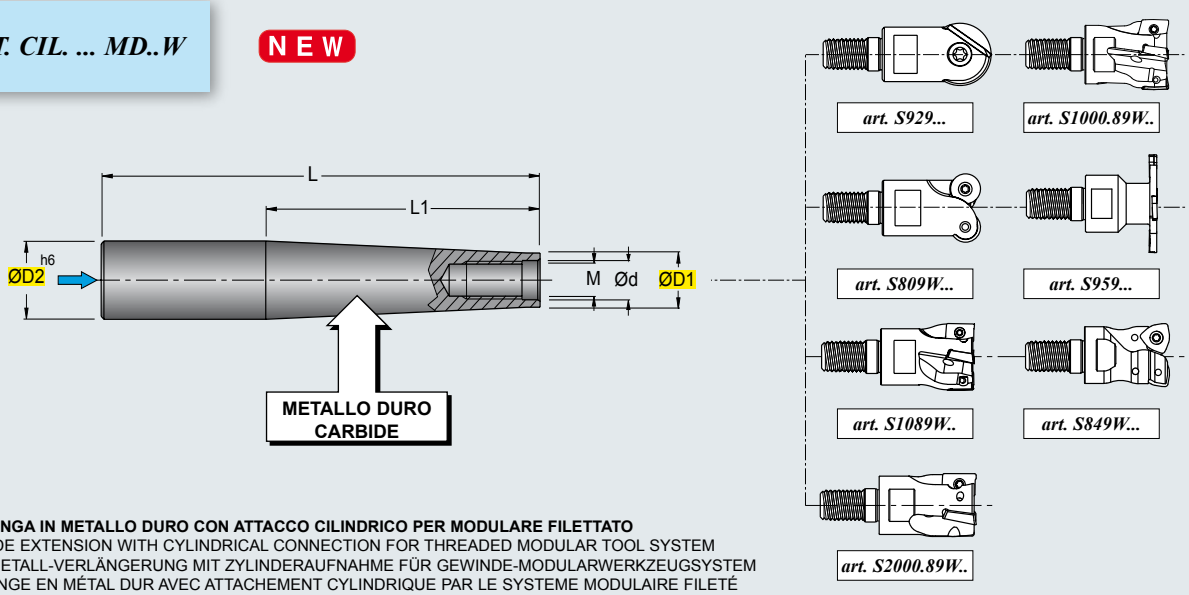


PORTAPINZA DIN 6499
COLLET HOLDER DIN 6499
FRÄSERSPANFUTTER DIN 6499
MANDRINS A PINCES DIN 6499

ART.	(mm) ØD2	Ød	ØD1	L	L1				
253.016.011.180W	16	0,5-7	16	180	160	GWR06	RGM ER11	938.011	–
253.020.016.200W	20	0,5-10	22	197	160	GWR10	RGM ER16	938.016	–
253.020.020.190W	20	0,5-13	28	190	160	GWR10	RGM ER20	938.020	–
253.025.020.190W	25	0,5-13	28	188	160	GWR12	RGM ER20	938.020	–
253.025.025.200W	25	0,5-16	35	200	160	GWR12	RGM ER25	938.025	–
253.032.032.200W	32	2-20	50	208	160	GWR16	RGS ER32	–	925.052
253.040.032.200W	40	2-20	50	193	160	GWR12	RGS ER32	–	925.052

ART. CIL. ... MD..W

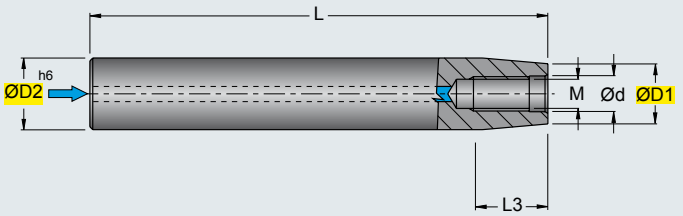
N E W

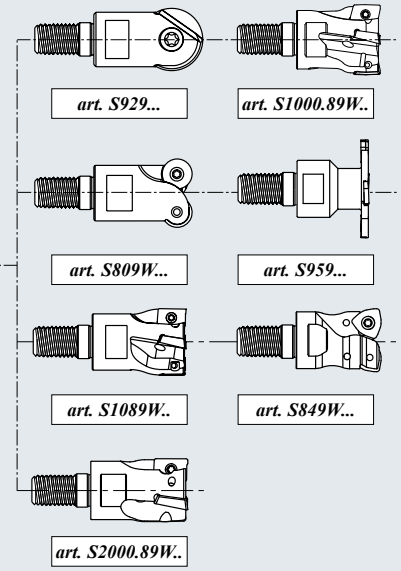


PROLUNGA IN METALLO DURO CON ATTACCO CILINDRICO PER MODULARE FILETTATO
CARBIDE EXTENSION WITH CYLINDRICAL CONNECTION FOR THREADED MODULAR TOOL SYSTEM
HARTMETALL-VERLÄNGERUNG MIT ZYLINDERAUFNAHME FÜR GEWINDE-MODULARWERKZEUGSYSTEM
RALLONGE EN MÉTAL DUR AVEC ATTACHEMENT CYLINDRIQUE PAR LE SYSTEME MODULAIRE FILETÉ

ART.	(mm) M	Ød	ØD1	h6 ØD2	L	L1
CIL.012.MD006.115W	6	6,5	10	12	115	60
CIL.012.MD006.135W	6	6,5	10	12	135	80
CIL.016.MD008.140W	8	8,5	13	16	140	80
CIL.016.MD008.180W	8	8,5	13	16	180	120
CIL.020.MD010.140W	10	10,5	18	20	140	80
CIL.020.MD010.180W	10	10,5	18	20	180	120
CIL.025.MD012.170W	12	12,5	21	25	170	100
CIL.025.MD012.210W	12	12,5	21	25	210	140

ART. CIL. ... MF ...W



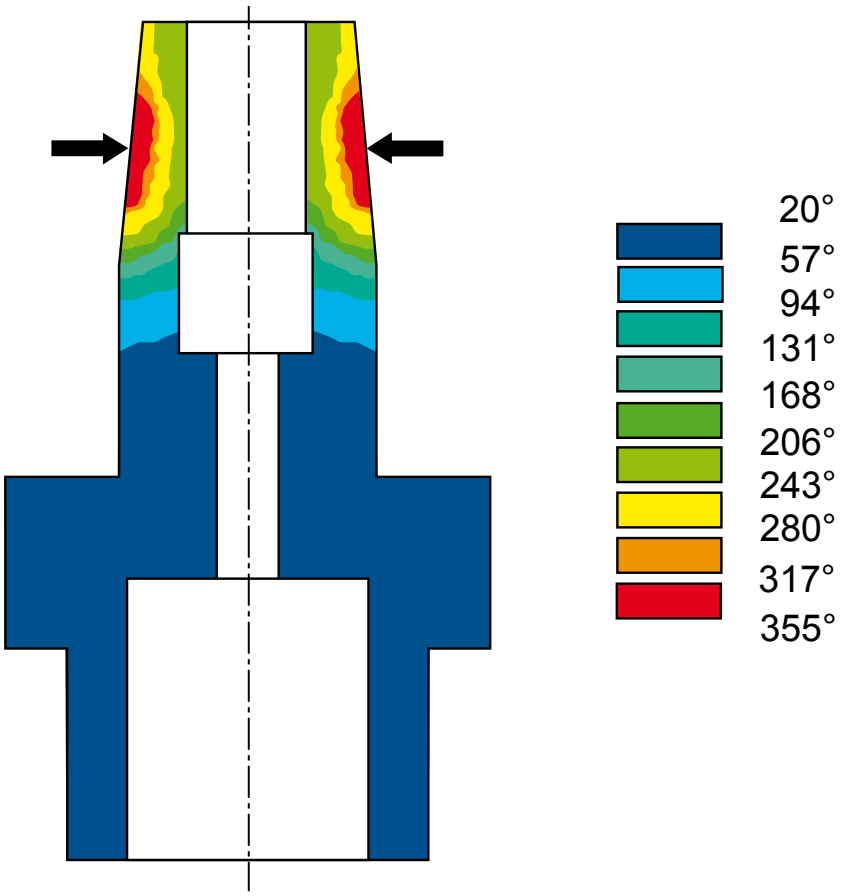


PROLUNGA IN ACCIAIO CON ATTACCO CILINDRICO PER MODULARE FILETTATO
STEEL EXTENSION WITH CYLINDRICAL CONNECTION FOR THREADED MODULAR TOOL SYSTEM
STAHLVERLÄNGERUNG MIT ZYLINDRAUFNAHME FÜR GEWINDE-MODULARWERKZEUGSYSTEM
RALLONGE EN ACIER AVEC ATTACHEMENT CILYNDRIQUE POUR LE SISTEME MODULAIR FILETÉ

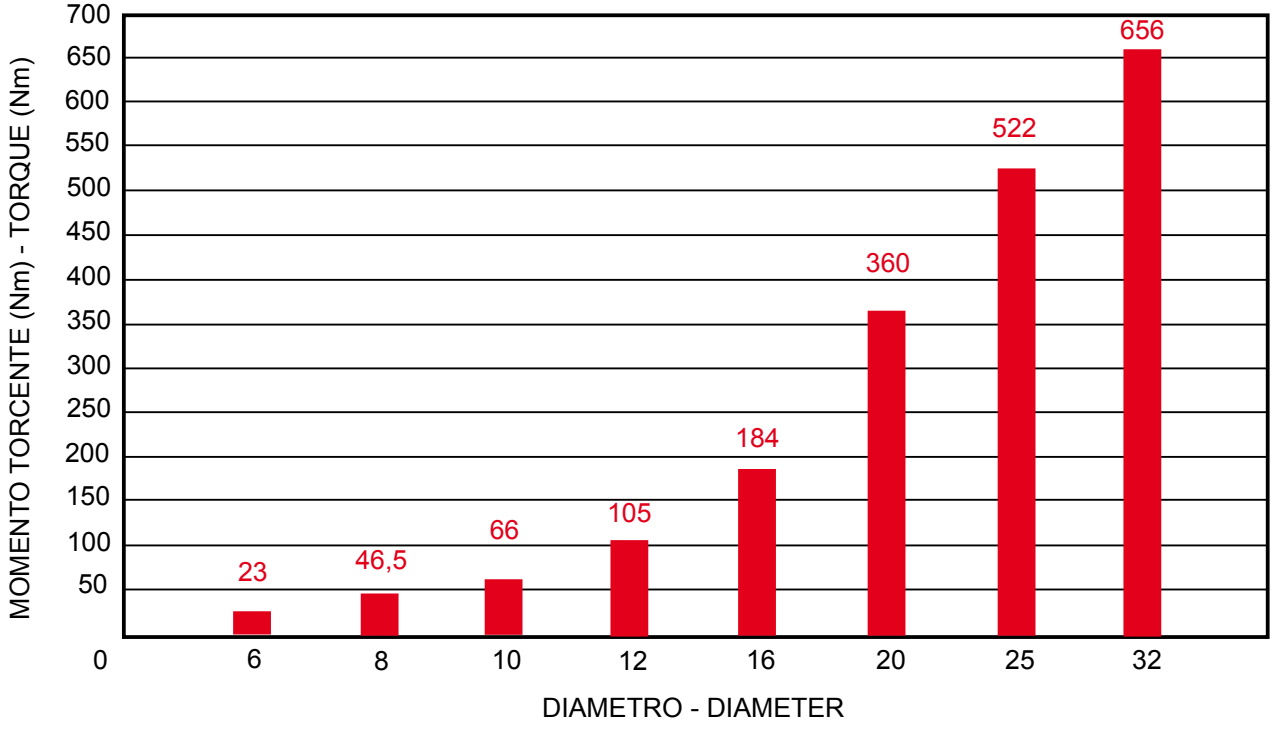
(mm)

ART.	M	Ød	ØD1	ØD2 h6	L	L3
CIL.012.MF005.115W	5	5,5	8	12	115	14
CIL.012.MF006.115W	6	6,5	10	12	115	14
CIL.016.MF008.127W	8	8,5	13	16	127	15
CIL.020.MF010.140W	10	10,5	18	20	140	15
CIL.025.MF012.160W	12	12,5	21	25	160	20
CIL.032.MF016.187W	16	17,0	29	32	187	20

TEMPERATURE
TEMPERATURES



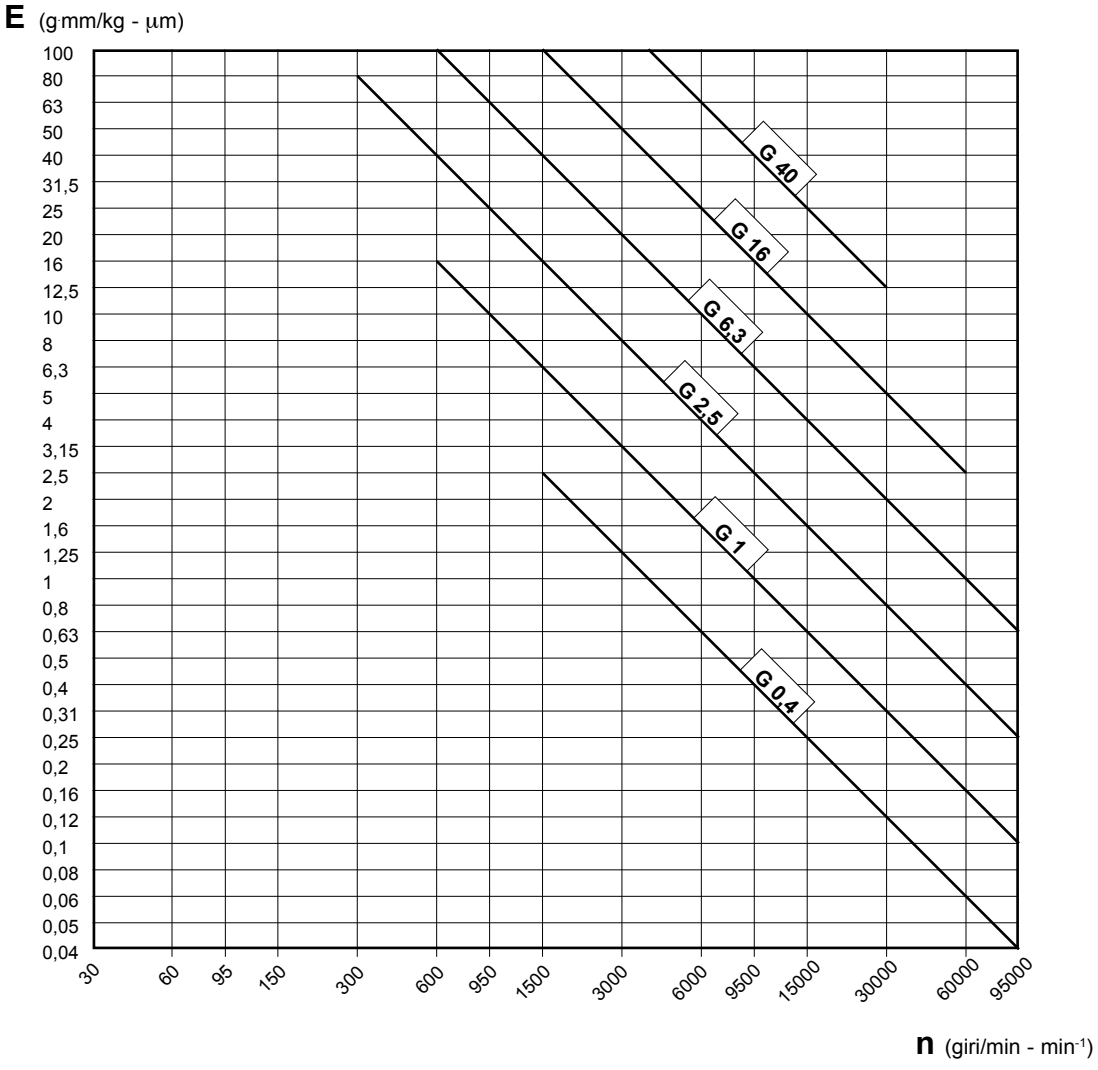
MOMENTO TORCENTE
TORQUE



G - CLASSE DI EQUILIBRATURA (NORMA ISO 1940)
G - BALANCING CLASS (STANDARD ISO 1940)

G (mm/sec)	= Velocità del baricentro	= Barycenter speed
E (g·mm/kg - μm)	= Squilibrio totale residuo accettabile per unità di massa (squilibrio residuo specifico) o scostamento della massa dal baricentro	= Total acceptable residual imbalance per unit of mass (specific residual imbalance) or deviation of the mass from the barycenter
ω (rad/sec - sec^{-1})	= Velocità angolare	= Angular speed
n (giri/min - min^{-1})	= Velocità di rotazione	= Rotation speed

$$G\ (mm/sec) = \frac{E \cdot \omega}{1000} \qquad E\ (g \cdot mm/kg - \mu m) = \frac{G \cdot 1000}{\omega} \qquad \omega\ (rad/sec - sec^{-1}) = \frac{n \cdot 3{,}14}{30}$$



VANTAGGI CON L'EQUILIBRATURA DEGLI UTENSILI - ADVANTAGES OF BALANCING THE TOOLS

- AUMENTA LA VITA DELL' UTENSILE
- AUMENTA LA VITA DEL MANDRINO
- MINORI SOLLECITAZIONI MECCANICHE DELLA MACCHINA
- MIGLIORA LA RUGOSITÀ DELLE SUPERFICI LAVORATE
- TOLLERANZE DIMENSIONALI PIÙ STRETTE
- MIGLIORA LA QUALITÀ DEL PRODOTTO

- INCREASED TOOL LIFE
- INCREASED CHUCK LIFE
- LESS MECHANICAL STRESS ON THE MACHINE
- IMPROVED ROUGHNESS OF MACHINED SURFACES
- REDUCED DIMENSIONAL TOLERANCE
- IMPROVED PRODUCT QUALITY

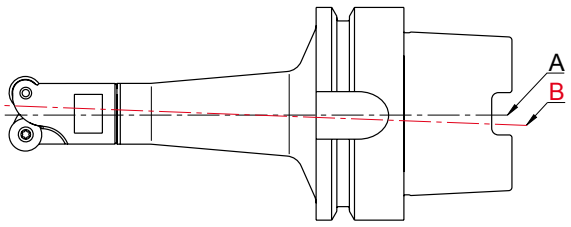
SQUILIBRIO ED EQUILIBRATURA
BALANCING AND IMBALANCE

- Lo squilibrio **U**, é lo scostamento tra l' asse di rotazione e l' asse geometrico (o baricentro). Viene anche definito come disuniformità di materiale rispetto all'asse di rotazione. Lo squilibrio indica la distanza di masse eccentriche in senso radiale, rispetto all'asse di rotazione.
- Lo squilibrio genera una FORZA CENTRIFUGA **F**, che cresce con il quadrato della velocità.
- L'EQUILIBRATURA ha lo scopo di limitare lo squilibrio residuo di un corpo rotante a valori logici in termini tecnici ed economici.
- La norma ISO 1940 definisce la classe di equilibratura per ogni tipo di corpo rotante allo scopo di definire uno squilibrio residuo accettabile che eviti eccessi di costi e grosse mancanze di equilibratura per lo scopo del rotante stesso.
- Per le macchine utensili e parti di macchine utensili la Norma ISO1940 stabilisce che é sufficiente una classe di equilibratura G6,3, classi superiori sono spesso inutili in quanto le eccentricità che si verificano in macchina durante l'uso, sono superiori a quelle dell'equilibratura.

- The imbalance **U** is the difference between the axis of rotation and the geometric (or barycentric) axis. It is also defined as a material unevenness in relation to the axis of rotation. The imbalance indicates the distance of eccentric masses in a radial direction, in relation to the axis of rotation.
- The imbalance generates a CENTRIFUGAL FORCE **F** which increases in proportion to the speed.
- The purpose of the BALANCING is to limit the residual imbalance of a rotating body to logical values in technical and economic terms.
- The Standard ISO 1940 defines the BALANCING CLASS for each type of rotating body, with the purpose of defining the acceptable residual imbalance that avoids excessive costs and large lacks of balancing for the purpose of the rotation itself.
- For machine tools and machine tool parts Standard ISO1940 establishes that a balancing class of G6.3 is sufficient; higher classes are often not useful because the eccentricities that exist in the machine during use are greater than the balancing eccentricities.

F	(N)	= Forza centrifuga rotante	= Rotating centrifugal force
U	(g·m)	= Squilibrio	= Imbalance
ω	(rad/sec - sec^{-1})	= Velocità angolare	= Angular speed
M	(kg)	= Massa del rotante	= Rotation mass
e	(μm)	= Scostamento del baricentro, eccentricità	= Deviation of barycenter, eccentricity
m	(g)	= Massa di equilibratura	= Balancing mass
r	(mm)	= Raggio su cui eseguire l'equilibratura	= Radius upon which balancing is performed
$\mathbf{m_a}$	(g)	= Massa residua accettabile	= Acceptable residual mass

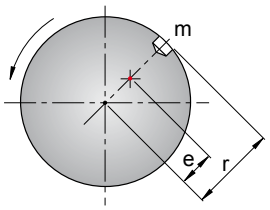
$$\mathbf{F}\ (N) = \mathbf{U} \cdot \omega^2 \qquad \mathbf{U}\ (g{\cdot}m) = \mathbf{M} \cdot \mathbf{e} \qquad \mathbf{m}\ (g) = \frac{\mathbf{M} \cdot \mathbf{e}}{\mathbf{r}} \qquad \mathbf{m_a}\ (g) = \frac{\mathbf{M} \cdot \mathbf{E}}{\mathbf{r}}$$



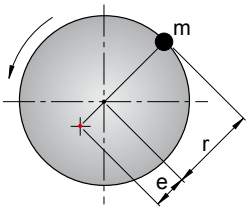
A - Asse di rotazione - Axis of rotation

B - Asse geometrico o baricentro - Geometric axis or barycenter

EQUILIBRATURA PER ASPORTAZIONE
BALANCING BY REMOVAL



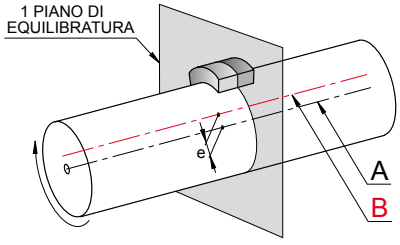
EQUILIBRATURA PER APPORTO
BALANCING BY ADDING MATERIAL



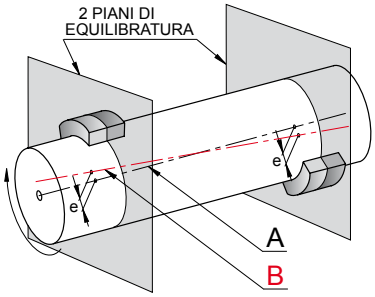
- Vengono considerati 2 tipi di squilibrio e relativa equilibratura : **STATICO** se misurato su di un unico piano, **DINAMICO** se misurato su 2 piani.
- I valori riportati nella tabella della classe di equilibratura, sono riferiti a squilibrio statico, per lo squilibrio dinamico e=e/2 per ogni piano di equilibratura

- Two types of imbalance and corresponding balancing are taken into consideration: **STATIC** if measured on a single surface and **DYNAMIC** if measured on 2 surfaces.
- The values listed in the table of balancing classes refer to static imbalance; for dynamic imbalance e=e/2 for each balancing surface

SQUILIBRIO STATICO (per utensili corti)
STATIC IMBALANCE (for short tools)



SQUILIBRIO DINAMICO (per utensili lunghi)
DYNAMIC IMBALANCE (for long tools)



NOTE

NOTE

NOTE

S.p.A.

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